Volume 35 No. 10 OCTOBER 1948

Plating

The Platers Dream

One Cleaner For all Purposes

CLEPO No. 144 is the Answer to the Dream

Check this table below to see if the Cleaner you are now using can do all these Jobs. If not send us an order for a trial drum of Clepo No. 144.

Recommended usage of Clepo No. 144

Base Metal	Direct Current	Reverse Current	Soak Cleaning
Steel	6-8 oz./gal.	8-12 oz./gal.	8-10 oz./gal.
Copper	3-4 oz./gal.	8-12 oz./gal.	4- 6 oz./gal.
Brass	3-4 oz./gal.	3- 4 oz./gal.	4- 6 oz./gal.
Zinc Base Die Castings	3/4-1 oz./gal.	3- 4 oz./gal.	4- 6 oz./gal.

Temperatures of 180-200° F. are Recommended

CLEPO CLEANING COMPOUNDS

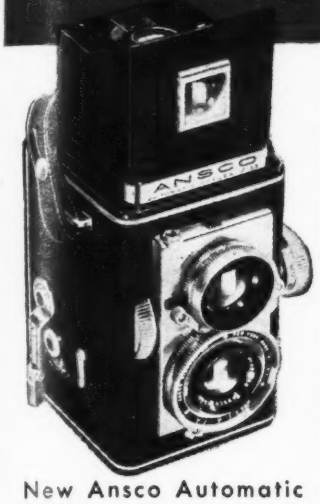
FREDERICK GUMM Chemical Company Inc.

538-542 Forest St., Kearny, N. J.

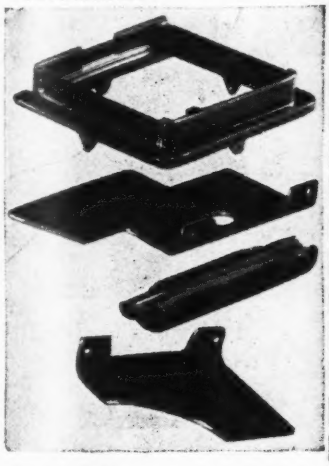
FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 680.

ANSCO

One of hundreds of users of the Enthone Alumon Process



New Ansco Automatic Reflex f 3:5 Camera.
Aluminum construction plated with nickel and chromium.



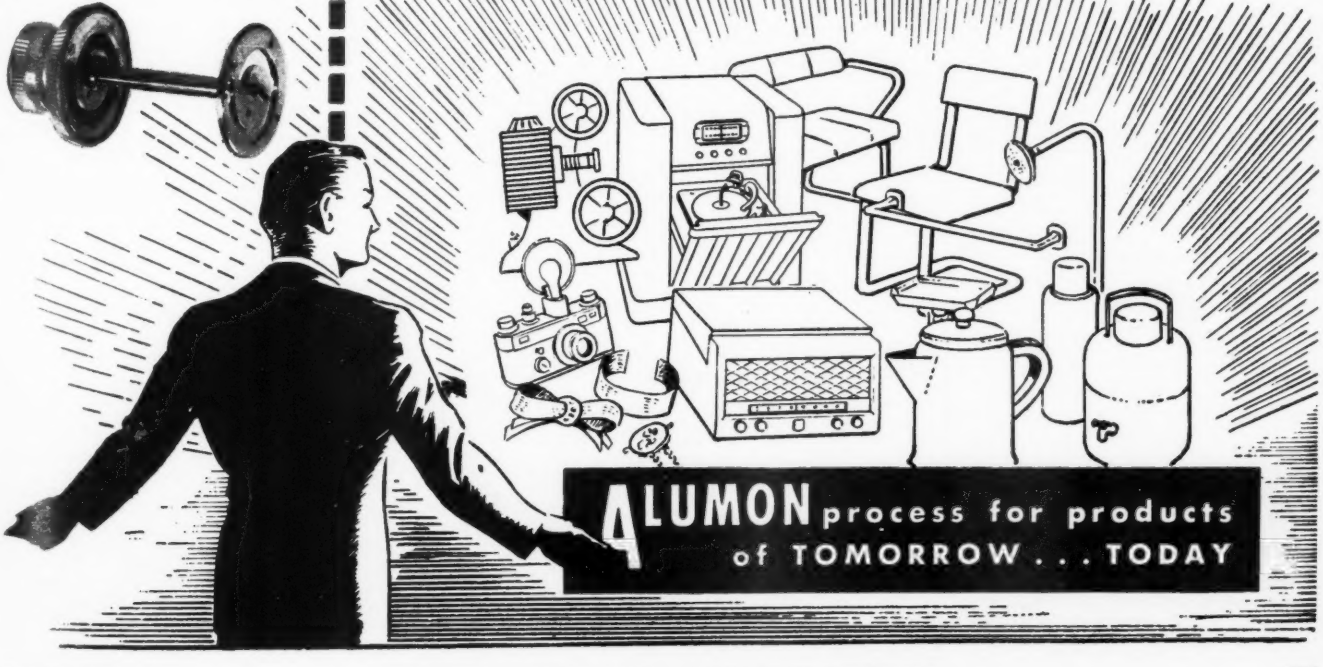
Enthone

ALUMON PROCESS OF PLATING OPENS IMPORTANT NEW USES FOR ALUMINUM

Hundreds of leading manufacturers now use plated aluminum — made possible and practical by the Enthone Alumon process. In addition to availability, you get aluminum's inherent advantages — lightness, low cost, durability, workability and strength — for articles requiring attractive plated finishes. Today you can plate aluminum with nickel, chromium, silver, gold and other metals, economically and just as simply as on steel or copper. New Enthone literature points out some of the new possibilities for the use of aluminum alloys in die castings, sand castings, rolled and wrought forms, all successfully plated by the Alumon Process.

Send sample parts for plating and technical advice from Enthone's experienced chemists.

ENTHONE, INC., 442 ELM STREET, NEW HAVEN, CONN.



ALUMON process for products of TOMORROW . . . TODAY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 681.

Industry News

Polishers and buffers are still hard to find according to the August 2 issue of the General Bulletin of Chicago Electroplaters' Institute, 2753 W. North Avenue, Chicago 47, Ill., an organization of job and contract platers in Chicago and vicinity. J. George Schneider is the Executive Secretary of the institute.

Alsop Engineering Corporation service to its customers was featured in an article which recently appeared in the Southington News, Southington, Conn. A complete filter unit was flown in a private plane from Stroudsburg, Pa., to the company's factory in Milldale, repaired, flown back to Stroudsburg, and put into operation on the same day.

Cowles Detergent Company, at a special stockholders meeting held in Cleveland, Ohio on August 16, changed the firm's name to **Cowles Chemical Company.** In making the announcement, Mr. Edwin Cowles, President of the Company, stated: "A change in the name of the company seemed advisable because the business of the company is becoming increasingly diversified and is no longer restricted to detergents. Since the company is largely engaged in manufacturing and selling a varied line of chemicals, it seems proper to change the name to Cowles Chemical Company."

Founded in 1885, the company has long been active in the manufacture of industrial chemicals and detergent silicates as well as specialized detergents for the laundry and metal cleaning industries. A postwar innovation has been the company's entry into the field of specially formulated cleaners and bactericides for the food processing industries. The change in the company's name is indicative of its continued further expansion in other industrial chemical fields. No change in ownership, management or policy is involved in the change in name.

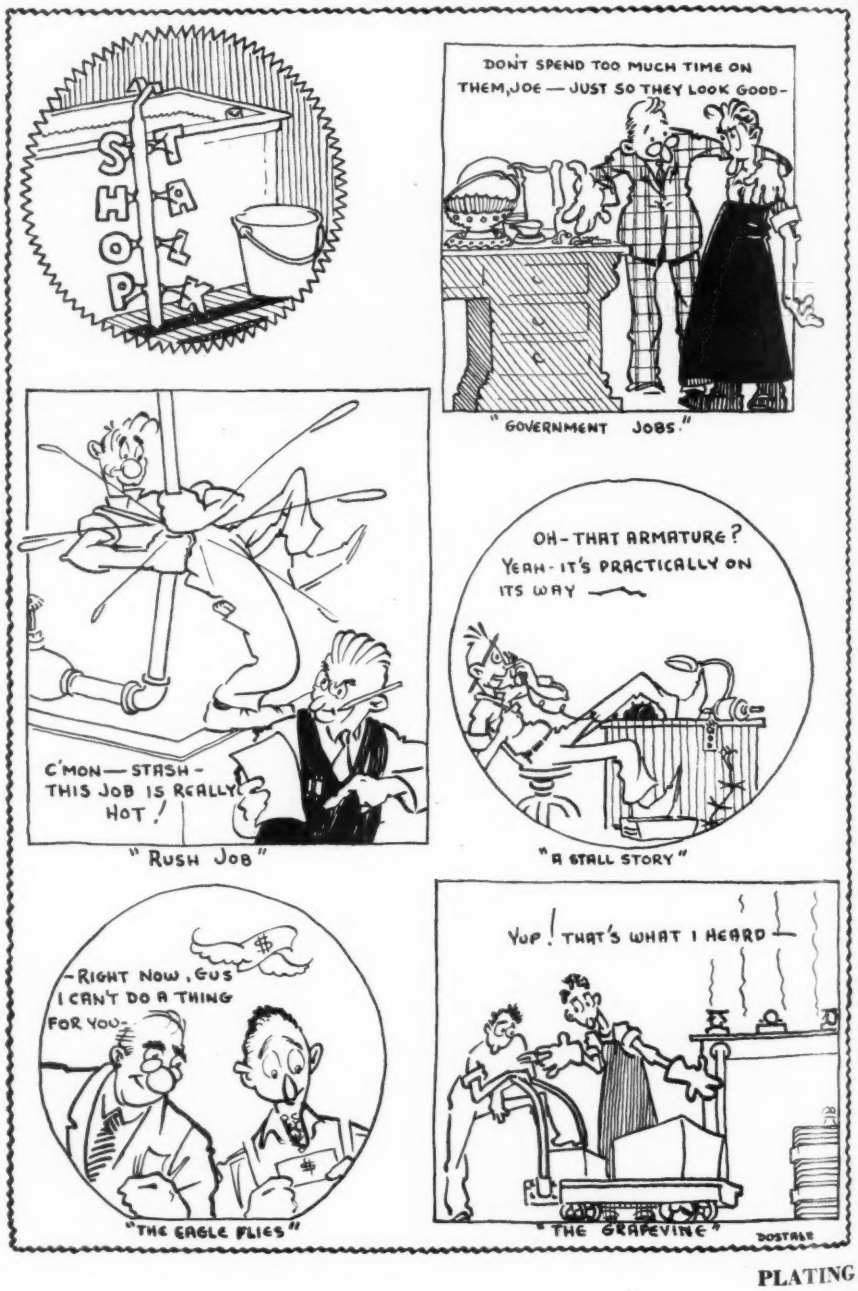
Lea Manufacturing Company, Waterbury, Conn., manufacturers of polishing supplies and plating chemicals, which celebrated its 25th Anniversary last Spring, recently issued an attractively printed 16-page booklet commemorating this event. It differs from most publications of that nature in that it is directed to the employees of the company, telling them about the early beginnings and subsequent growth and setting forth the many company activities that are carried on for their benefit.

The management of the company consists of Robert R. Leather, inventor of greaseless buffing compounds, President; Earle W. Couch, Vice-President and Treasurer; Richard P. Crane, Vice-President in Charge of Sales and Advertising; Dr. Henry L. Kellner, Secretary and Technical Director; Ellsworth T. Candee, Director of Research and Development; William D. Starr, Assistant Secretary and Assistant Treasurer; and Marion G. Lynch, Controller.

Our congratulations on work well done.

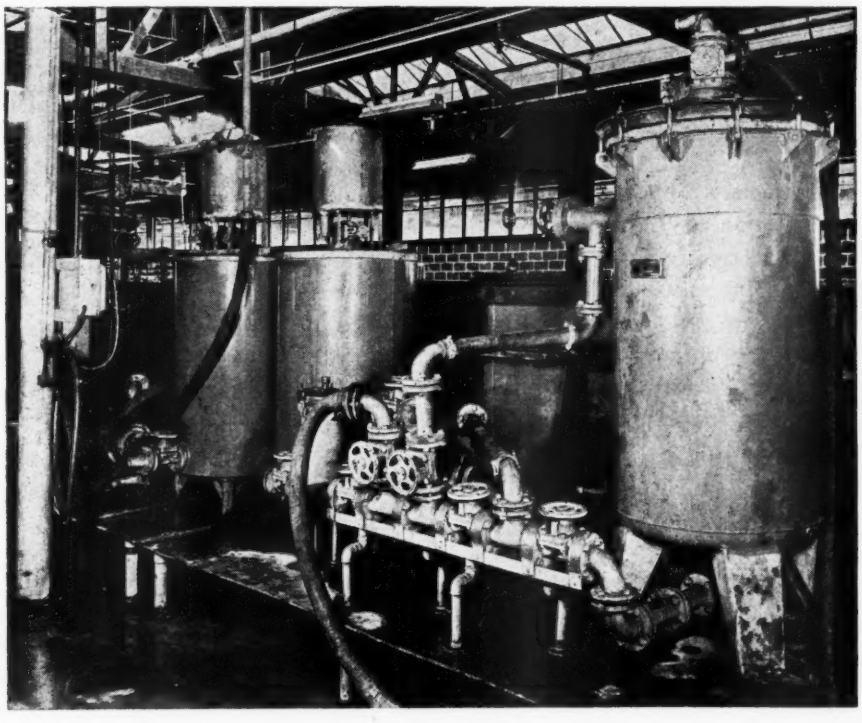
De Vilbiss School of Spray Painting has already provided several comprehensive one-week courses for industrial finishers during the second half of 1948. Maintained as a service to all users of De Vilbiss equipment, these tuition-free courses include instruction in spray painting technique and function and care of spray equipment. The remaining classes, lasting one week each, will begin on October 11 and December 13, each covering the same instruction. Since class size is necessarily limited, it is advisable to write for reservations as early as possible to The De Vilbiss Company, 300 Phillips Avenue, Toledo 1, Ohio.

"Records That Control Quality Control" and a companion film, "A Game of Chance", are combined in a 35-minute clinic presentation featuring a practical discussion on quality control records in manufacturing. These new soundslide films give a case history on how a user of a Standard Register system of record


SHOP TALK
DON'T SPEND TOO MUCH TIME ON THEM, JOE — JUST SO THEY LOOK GOOD-
"GOVERNMENT JOBS."
C'MON — STASH - THIS JOB IS REALLY HOT!
"RUSH JOB"
OH - THAT ARMATURE? YEAH - IT'S PRACTICALLY ON ITS WAY
"A STALL STORY"
-RIGHT NOW, GUS I CAN'T DO A THING FOR YOU-
"THE EAGLE FLIES"
YUP! THAT'S WHAT I HEARD
"THE GRAPEVINE"
DOSTALE

Published monthly at 5800 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Copyright, 1948, by the American Electroplaters' Society, Inc. Subscriptions: Domestic and Canada, $4.00 per year, 50c per copy; Foreign, $6.00 per year, 75c per copy.

PRODUCTION *FILTRATION*



The above photo shows a large capacity "INDUSTRIAL" filter in use with a high production plating machine in a chrome furniture plant.

"INDUSTRIAL" filters are made in a variety of sizes and types. There are standard units available for every plating room need. Other "INDUSTRIAL" filters are clarifying the following liquids:

PICKLING LIQUORS	**NEUTRALIZERS**	**SOLVENTS**
BONDERITE SOLUTIONS	**ALCOHOL**	**COOLANTS**
NICKEL DIP	**KEROSENE**	**VARNISH**
INDUSTRIAL OILS	**WATER**	**OTHER LIQUIDS**

Before you buy—find out why "INDUSTRIAL" filters have remained the choice in leading industrial plants for over twenty years.

INDUSTRIAL FILTER & PUMP MFG CO.

1621-39 WEST CARROLL AVENUE CHICAGO 12, ILLINOIS

IMPROVE YOUR TUMBLING... BURNISHING AND DE-BURRING WITH MAGNUS LUBRICANTS

MAGNUS specialized lubricants and burnishing compounds are the result of a quarter of a century of development work in the field of tumbling and burnishing. Many of the standard compounds now offered are the result of long, hard research to solve particular problems in these finishing operations. And we are still called on to solve special problems along these lines.

All the Magnus materials recommended below have been tried and proved in many plants. They can do an equally good job for you.

TUMBLING This cutting down operation is materially improved by the use of Magnus ‡25 for steel, Magnus ‡58-HL for brass, and Magnus ‡58 on aluminum or die cast parts.

BURNISHING Magnus burnishing compounds insure development of high luster without overheating and without abrasion of the parts. They offer faster burnishing and complete rinsibility after the burnishing job is done. Usually only 4 oz. to 100 lbs. of work are required.

For steel and stainless steel, Magnus ‡52-B has proved highly economical and satisfactory. ‡58-HL is recommended for brass and copper, ‡58 for aluminum, and ‡7 for die castings.

DE-BURRING Removal of undesired metal by manual methods like grinding and filing is not only expensive but undependable. Suitable modification of tumbling technique plus careful selection of Magnus lubricants will enable you to limit your cut to projecting burrs, while surfaces that otherwise would tend to rub each other are protected from abrasion.

You can de-burr with the proper Magnus lubricant many times faster and much more dependably than by manual methods.

If you have any problems in tumbling, burnishing or de-burring, ask us to help. The right Magnus lubricant may solve them!

MAGNUS CHEMICAL COMPANY
11 South Ave., Garwood, N. J.
In Canada—Magnus Chemicals, Ltd., 4040 Rue Masson, Montreal 36, Que.
Service representatives in principal cities

IN METAL CLEANING IT'S Magnus
CLEANERS • EQUIPMENT • METHODS

Industry News

control reduced scrap rejects 23 per cent. Shown are the weaknesses common to many inspection report systems causing mixups of rejected material with good work passing through production, repeated inspection and reporting of the same lots of material, shortage of material at assembly, and distorted reports to management. The film demonstrates a system that provides control of men, material, and machines through control of every original record written. It also shows how management can be sure of receiving accurate reports on the effectiveness of quality control program. The clinic presentation is made without charge by representatives of The Standard Register Company as a basis for open discussion of quality control principles and problems dealing with basic records and systems of control. For further information, write The Standard Register Company, Dayton 1, Ohio.

Wyandotte Chemicals Research Staff staged a new type of seminar meeting in Hotel Statler in Detroit on July 21. This, the 3rd annual staff meeting, featured 19 exhibits depicting various phases of the activities of the organization and arranged in trade convention style.

Andrew Liger, Industrial Laboratories head, shows surface roughness measuring instruments to Evans Schmeling, Assistant Manager of Chemicals Industrial Department

The display which attracted the greatest attention was equipment now being used in investigating the application of radioactive materials as tracers in detergency, studies which should result in improved products and advanced methods. Several displays showed equipment capable of measuring to a millionth part of an inch and of enlarging electronically and photographically 40,000 times. One exhibit featured the commercial application of a material which promotes synthetic detergents which formerly had limited application.

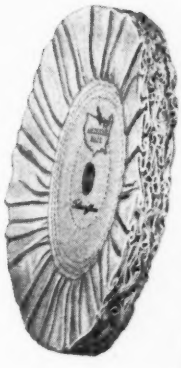
Correspondence Course in Electroplating. Joseph B. Kushner, Metal

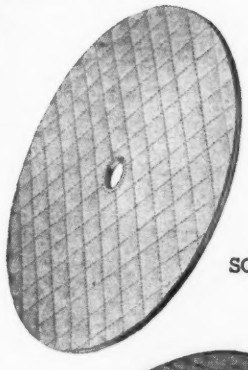
I'M A FINISHER AND I SAY:—

"It's Always Best—Compare!"

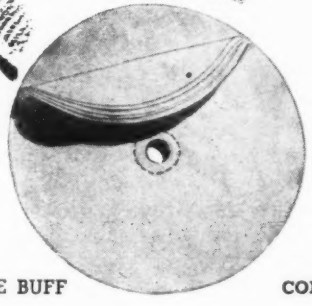
AMFLOW

SHURFLOW





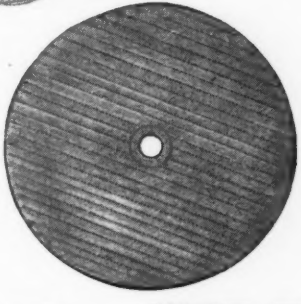
SQUARE SEWED



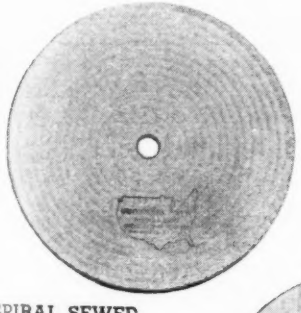
LOOSE BUFF

Compare American Buff Company . . . compare the various types of buffs they make . . . there's a buff for every specific purpose . . . not just one "cure-all."

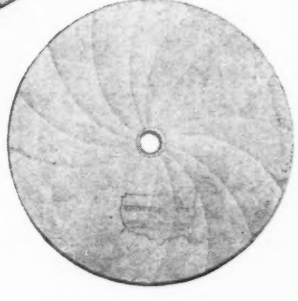
Write or wire them, today, and see if you can save on your finishing jobs.



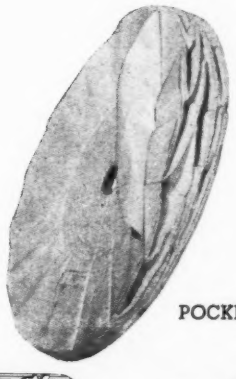
PARALLEL SEWED



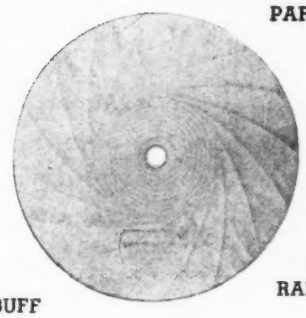
SPIRAL SEWED



RADIAL ARC



POCKET BUFF



SPIRAL RADIAL ARC

American Buff Company

Main Plant and Offices

2414 South La Salle Street • Chicago, Illinois

ADV. BY S. S. LOVITT CO.

DEPENDABLE EXHAUST DUCTS PAY THEIR WAY

Build them to last. Build them to avoid breakdowns, shutdowns and wearouts

STORTS has fabricated hundreds of strong, efficient, long-lived exhaust hoods and ducts—for practically every variety of plating and processing operation. Stoutly framed and soundly welded, they are designed and built for trouble-free performance. Cost records show that noticeable savings in operating and maintenance costs result from specifying the sturdy and enduring construction that is a Storts specialty.

If you have new exhaust systems, alterations or replacements in the planning stage, note that Storts can make many helpful suggestions, based on more than twenty years of experience in this important specialty.

STORTS WELDING COMPANY
INCORPORATED
42 Stone Street Meriden, Conn.

Manufacturers of Welded Fabrications to Specifications

Industry News

Finishing Engineer, of New York City and Stroudsburg, Pa., announces the inauguration of a new correspondence course for electroplaters, called "Electroplating Know-How". The course, which will be conducted by mail from Stroudsburg, has been designed to give practical platers a solid background in the plating fundamentals so that they can carry on plating operations from a more modern and scientific point of view and advance themselves in their work. Along with the "know-how" of plating, it is said to give the "know-why" in simple, easy-to-understand language and experiments that teach a man to "think" plating. Further information may be had directly from Joseph B. Kushner, Stroudsburg, Pa.

Allied Research Products, Inc., Baltimore, has announced that the following agents have been appointed for the sale of Iridite, the corrosion protective treatment for zinc and cadmium surfaces: L. J. Camill, Detroit, Mich., to cover all of the state of Michigan; J. A. Cairns, Yeadon, Pa., to cover eastern Pennsylvania and New Jersey; Industrial Chemical and Equipment Company, Minneapolis, to cover Western Wisconsin and Minnesota; Lasalco, Inc., St. Louis, Mo., to cover the central Southwest; C. H. Hohner, Atlanta, to cover the southeast states.

Mitchell-Bradford Company, Bridgeport, Conn., continues to cover New York and New England; A. L. Poe, Chicago, continues as District Sales Manager for Chicago and the central states; J. C. Baker, Cleveland, continues in Indiana, Ohio and western Pennsylvania.

SALES REPRESENTATIVE WANTED

Leading manufacturer of cloth buffing wheels has openings in several territories for commission salesmen. Other lines may be carried. Write stating territory covered, lines carried, and experience. *Reply to:*

P-10 A, PLATING
P. O. Box 168, Jenkintown, Pa.

NON-CONDUCTIVE PLATER

I am a young man with existing large factory, and practical knowledge, also commercial abilities in connection with electro-plating on plastics, glass, china, paper, everything in connection with non-conductive articles.

I wish to correspond with firms already established in metal plating in the United States of America. Samples sent and further details if requested.

B. BERGER
22, Farm Avenue
London, N. W. 2, England

Burnishes Better and FASTER

Features

Patented bearing construction assures smooth running — No vibration even with capacity load.

Direct Drive — No belts. Gears fully enclosed.

Motor mounted on top, out of the way — Stays dry — Easily accessible.

Accurately balanced for easy tilting.

Self-sealing cover of light-weight aluminum.

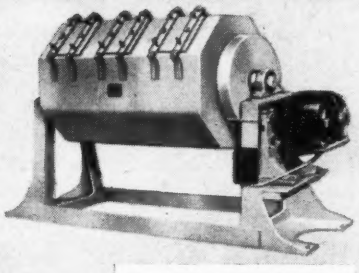
Spring-pressure ratchet lock, released by handy foot lever, holds barrel securely at any angle.

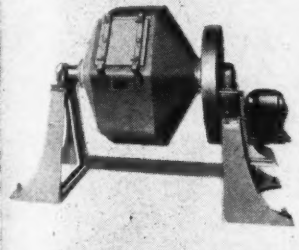
Hard maple lining — easily removable.

Three standard sizes.

DEBURRING BARRELS

3 - compartment barrel can be used for three different deburring jobs at one time. This model is also available with 1, 2 or 4 compartments.

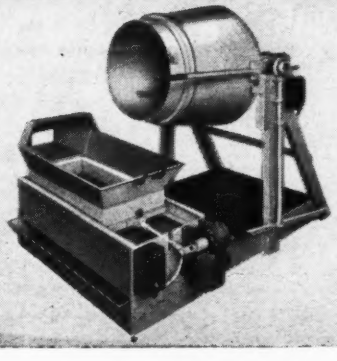




Triple-Action Deburring Barrel for very fast cutting. Specially shaped sides greatly increase tumbling action and reduce deburring time. Ideal for removing heavy burrs and smoothing extremely rough surfaces.

SAWDUST DRYING BARREL

Combination Steam-Heated Sawdust Barrel and Separator. The winning combination for maximum efficiency. Dries the work quickly, leaving it bright and spotless, and separates it from the sawdust without handling.



BELKE *Better-Built* BURNISHING BARRELS

The Modern Low-Cost Method of burnishing stampings, die castings, machined parts and other small pieces. Produces more uniform work with less rejects, and requires less space and labor.

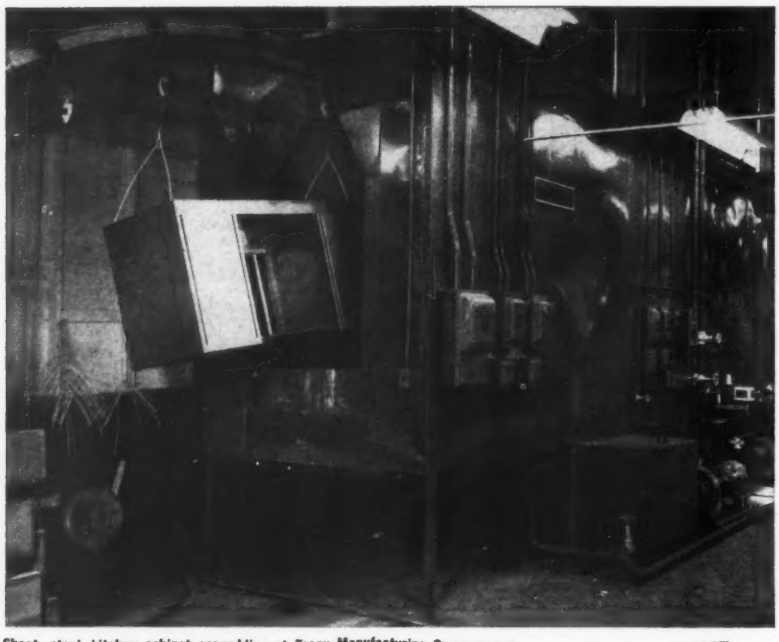
Heavy, welded-steel frame and base affords absolute rigidity. Will not warp or twist when used on rough or uneven floors. There are no protruding feet or braces to interfere with the operator. Patented radial and thrust bearing construction assures that the balls always run in a perfect race regardless of the position of the barrel, providing smooth, long wearing operation.

Write for additional information today or ask to have a BELKE Engineer call and help you select the proper barrel and tumbling compound to do your job most efficiently.

Belke
MANUFACTURING CO.
947 North Cicero Ave. • Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 686.



Sheet steel kitchen cabinet assemblies at Tracy Manufacturing Company are Duridized in this power spray washer for long paint life and overall product protection.

Chemicals for Rust Proofing Paint Bonding

American Chemical Paint Co.

TECHNIGRAM

AMBLER, PA.

Pickling Acid Inhibitors Rust Removing Preventing

Lasting Paint and Metal Protection at a Minimum Cost!

DURIDIZING provides simple, effective, economical, rapid cleaning and phosphate-coating of sheet steel products in preparation for painting. The process requires but one chemical, "DURIDINE"—is free from sludge—can be applied by spraying or dipping in mild steel equipment—and imparts excellent protection to painted sheet metal. It can also be used to clean and condition aluminum and other non-ferrous metals for a lasting paint finish.

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING
Granodine *
Duridine *
Rodine *
Lithoform *
Thermoil-Granodine *

RUST REMOVING AND PREVENTING
Deoxidine *
Peroline *

PICKLING ACID INHIBITORS
Rodine * ®

Visit the **ACP DISPLAY** of Inhibitors and Metal-Working Chemicals at the

National Metal Exposition

Sponsored by
The American Society For Metals

BOOTH 1654 -- COMMERCIAL MUSEUM

PHILADELPHIA, PA.

OCTOBER 25—29, 1948

Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PA.

Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 687.

Personals

Victor F. Allen, formerly Superintendent of Phoenix Engineered Products and Giles Plating Industries, is a new addition to the sales and service department of W. W. Wells, Limited, Toronto, Ontario.

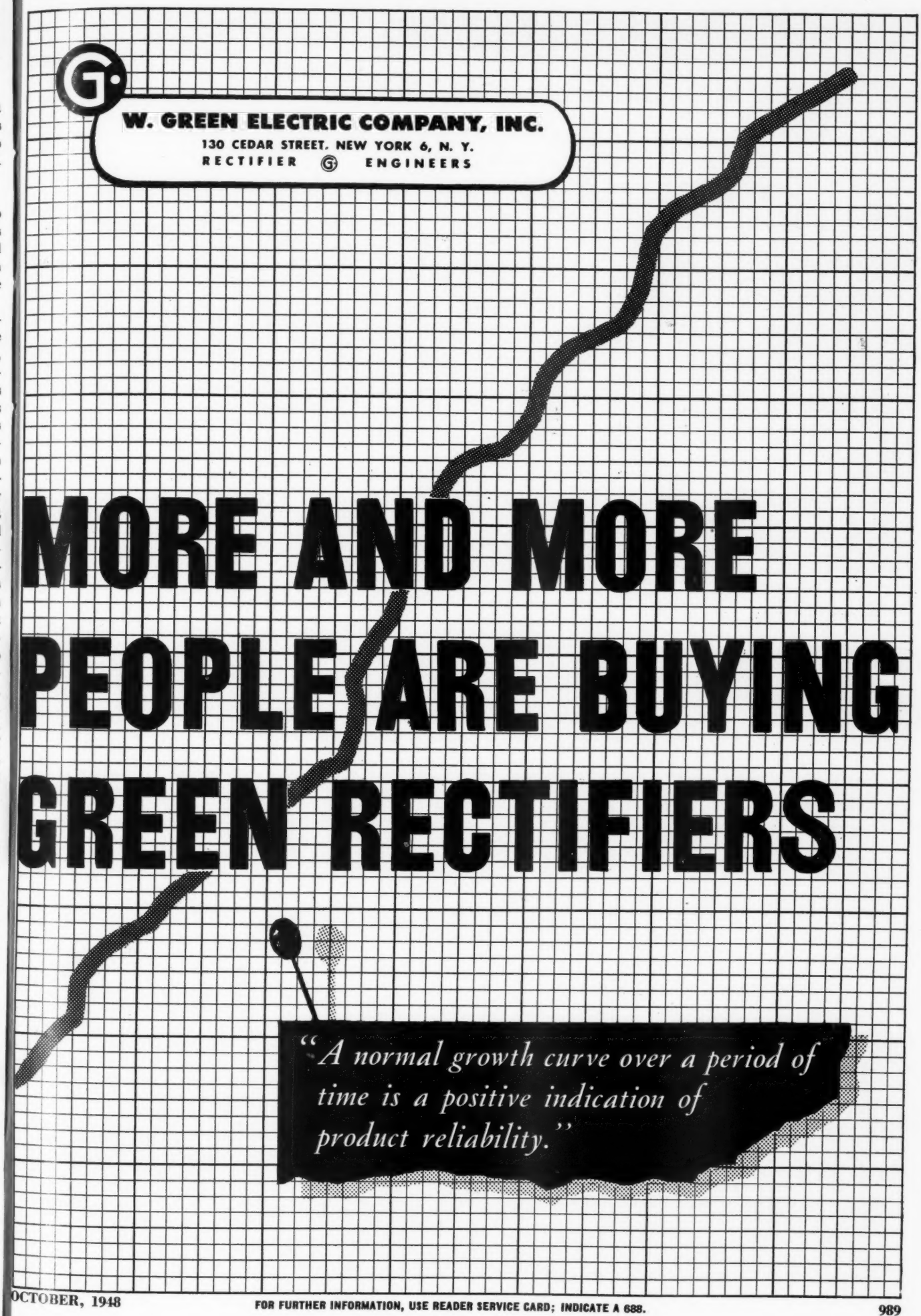
Henry B. Clark has been appointed to the managership of the New York sales office of Diamond Alkali Company, and **Charles L. Flaccus, Jr.,** has been named Assistant Branch Manager of the same office.

Mr. Clark, who has been Branch Manager of the company's Boston sales office since 1946, succeeds Charles V. Douglas, whose resignation becomes effective August 15. To his new post Mr. Clark brings a background of fourteen years' sales experience in alkali and related chemicals and an intimate knowledge of their diversified applications throughout eastern industries. Associated with a textile finishing firm in Staten Island, N. Y., for seven years following his attendance at the University of Michigan, he joined Diamond in 1934 and proceeded to represent it in a sales capacity in the company's New Jersey territory until his selection to head the Boston office in 1946. A Garden Stater by birth, Clark is forty-two and a member of the American Chemical Society, the Chemical Club of New England, and the American Association of Textile Colorists and Chemists.

A Diamond salesman since 1933, Mr. Flaccus has worked out of the New York office for the last nine years. A native of Pittsburgh, where he attended Shadyside Academy, he graduated from Harvard University in 1931 with an A.B. degree. He is thirty-nine years old.

George D. Maves has been named Manager of the Boston Branch of Minneapolis-Honeywell Regulator Company and its industrial division, Brown Instrument Company, being promoted from Mountain Regional Manager for the company with headquarters in Denver. He joined Honeywell in the factory inspection department in 1935 and rose successively to the air conditioning sales division in the home office and later to the Houston branch. In 1942, he was transferred to Denver and was made manager of that office in 1946. A year later he was named Regional Manager for the Mountain region which includes Colorado, Utah and parts of Idaho, Nebraska, Wyoming and Nevada.

Succeeding Maves in Denver is **Edwin A. Thompson,** who has been promoted from the Peoria branch managership. Thompson joined Honeywell in Dallas in 1939 and was later transferred to the Kansas City Office. He was named Peoria-Davenport Manager in 1945. Rob-

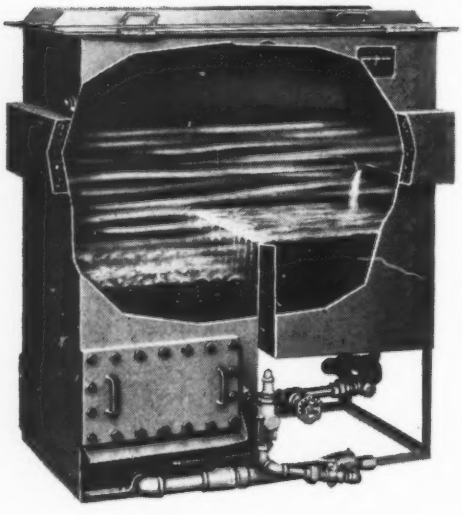

W. GREEN ELECTRIC COMPANY, INC.
130 CEDAR STREET. NEW YORK 6, N. Y.
RECTIFIER ENGINEERS
MORE AND MORE
PEOPLE ARE BUYING
GREEN RECTIFIERS
"A normal growth curve over a period of time is a positive indication of product reliability."

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 688.

ANNOUNCING THE DETREX

"625" Two-Dip Hand-Operated DEGREASER

With Quick-Conversion Heating



The Detrex "625" Degreaser provides for rapid, safe and thorough cleaning of small metal parts of all kinds in machine shops, production and maintenance departments. It can be heated by steam, gas or electricity, whichever is most practical at the particular time and location; and it is quickly converted from one type of heating to another where seasonal changes give added economy.

NOTE THESE FEATURES:

- **FAST!** Removes grease, oil and similar materials 5 to 10 times as fast as other methods.
- **EASY TO USE!** Simply lower the parts into the boiling solvent, transfer to cool rinse compartment and remove through vapor zone.
- **THOROUGH!** Leaves all surfaces, external and internal, clean and dry.
- **ECONOMICAL!** Built for long, trouble-free service life; has no moving parts. Quick change of heating method cuts operating cost.
- **SAFE!** The solvent used is non-flammable; *cannot burn or explode.*
- **COMPACT!** Model shown occupies less than 10 sq. ft.
- **AMPLE CAPACITY!** Handles 1000 lbs. of steel per hour· Immersion-cleans parts in space 18"x21"x12" deep; vapor-cleans parts up to 4 ft. long.

Write for Full Details and Specifications!

Degreasing Machines and Safety Solvents • Metal Parts Washers
Alkali and Emulsion Cleaners and Strippers • Processing Equipment • Spray Booth Compounds

DETREX Corporation
DETROIT 32, MICHIGAN

Personals

ert H. Jacobs has been named Peoria manager. Jacobs joined Honeywell in 1944 and was assigned to the Milwaukee branch sales department. A graduate of Marquette University, he previously had worked for the Parker Pen Company and Standard Oil Company in Pittsburgh and Milwaukee.

Dr. Harold K. Work, Manager of Research and Development, Jones & Laughlin Corporation, Pittsburgh, Pa., and known in electroplating circles for his pioneering work on methods for plating on aluminum, has been nominated president of the American Society for Metals; and **Dr. Arthur E. Focke,** Research Metallurgist, Diamond Chain and Manufacturing Company, Indianapolis, Ind., has been nominated Vice-President.

Raymond Stricklen, Jr., is now Assistant Development Engineer with Allied Research Products, Inc., Baltimore, Md. He was formerly with Turco Products, Inc., and is an active member of the Baltimore-Washington Branch of the American Electroplaters' Society.

Barney B. Hoffski is now with Michigan Buff Company of Detroit in charge of its new modern buff manufacturing plant.

Hoffski

He formerly held the same position with The Udylite Corporation for about fifteen years.

Edward J. Mahar and **Robert E. Wright** have joined the industrial finishes sales force of the Atlas Powder Company. Mr. Mahar will sell the Zapon line in Western Massachusetts, Mr. Wright, in the Philadelphia area.

Mr. Mahar, a New Englander by birth, attended the University of Southern California and, prior to coming with Atlas, was with W. P. Fuller Company and also Hedstrom-Union Company. During the war he was a Captain in the Air Force and had the honor of being selected to fly one of the first jet planes in the Air Force.

Mr. Wright comes to Atlas with a sales background in finishes, inks, and industrial chemicals and has for the past ten years been associated with Cushman and Denison. Prior to that time he was with American-Marietta and Oakite Products.

HERE'S PHOTOGRAPHIC PROOF

that zinc plate is improved 2 ways

by UNICHROME CLEAR DIP

AFTER TREATMENT
TREATED AREA AFTER 48 HOURS
1. IN EYE APPEAL
Lower half of this steel part shows how it looked after zinc plating; upper half shows effect of treatment in Clear Dip.
2. IN CORROSION RESISTANCE
How part appeared after 48 hours in salt spray booth. Virtually no change in treated upper portion; severe corrosion on untreated zinc plate below.
BEFORE TREATMENT
ORDINARY ZINC AFTER 48 HOURS

STUDY THIS unretouched picture for a moment—the evidence is all there.

Both the steel parts you see were plated in ordinary zinc. Then the upper half of each was treated in Clear Dip. The left-hand cylinder displays the great difference made in *brilliance*. That lustrous finish would be difficult to tell from chromium!

And it *stays* bright! No doubt about it when you look at the right-hand cylinder. It came out of a salt spray booth after 48 hours—with virtually *no change at all on the upper area protected by Clear Dip*. Here is zinc with "fixed" brightness! It won't lose lustre in shipment, "on the shelf," or in reasonable use.

Immersion for only 5 to 20 seconds in Clear Dip works those wonders. What's more, paints and lacquers find a firm foothold on surfaces treated with Clear Dip—so you can also use it for *priming* zinc.

For anyone now using zinc, Unichrome Clear Dip makes good sense. If you haven't tried zinc plating on your product, consider it now—because with this chemical treatment available, you can put out a high grade finish yet still cut finishing costs.

WRITE NOW FOR BULLETIN

It gives you detailed information on operation and advantages. Write your nearest United Chromium office.

UNICHROME

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Unichrome Stop-Off Lacquers and Compounds • Unichrome Dips
Unichrome Rack Coatings • Anozinc* Compounds • Unichrome Strip

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for a bright, smooth finish

start with WYANDOTTE

IN THE complete Wyandotte line, there's a product especially adapted to each and every barrel-finishing operation.

Wyandotte Burnishing Compound 317 gives ball-burnished parts of zinc a brilliant finish. Its action is not affected by water hardness. Its cutting qualities help speed the tumbling of steel, brass, copper and zinc with stones. It is free-rinsing and leaves no soap "scum" on the work or in the barrel.

Wyandotte Burnishing Compound 320 gives a highly satisfactory finish to parts of brass, copper, bronze or steel.

Wyandotte Burnishing Compound 321 contains a non-toxic bright-ening agent which provides ball-burnished parts of steel, copper, brass and nickel with a high luster. It does not require the addition of sodium cyanide.

Wyandotte Burnishing Powder is economical for ball-burnishing or tumbling steel with stones. *Wyandotte 80* (for tumbling steel) and *Light Alloy No. 1* (for zinc and aluminum) have thorough detergent action on light soil, in hard or soft water.

For consistently fine results, at low cost, specify *Wyandotte* Burnishing and Burring Compounds. Your Wyandotte Representative will be glad to give you complete details. He's only a telephone call away.

Wyandotte
REG. U. S. PAT. OFF.

WYANDOTTE CHEMICALS CORPORATION • WYANDOTTE, MICHIGAN
SERVICE REPRESENTATIVES IN 88 CITIES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 691.

Personals

His headquarters will be in the Land Title Building in Philadelphia, Pa.

Ray R. West has been named Manager of Sales of Minneapolis-Honeywell Regulator Company products for industrial applications. He will make his headquarters at the Brown plant in Philadelphia.

Arthur L. Perkins is the new Eastern Representative of Hammond Machinery Builders of Kalamazoo, Mich. Mr. Perkins, who is well known in the East for his practical knowledge of metal finishing, is now located at 5C River Park Apartments, White Plains, N. Y.

Perkins

Robert O. Blackford has been appointed Advertising and Sales Promotion Manager of Michigan Abrasive Company, Detroit, Mich. A graduate of Michigan State College, Mr. Blackford has previously served in sales and branch management capacities in Grand Rapids, Toledo, Cleveland and Detroit.

Blackford

Both his grandfather, W. H. Beamer, and his father, Charles O. Blackford, are identified with the abrasive industry. The former started in 1903 with the Herman Behr Company, forerunner of Behr-Manning Company, and was joined in 1922 by the latter. Mr. Beamer retired in 1928, but Charles Blackford still continues in this industry.

Charles R. Ince, formerly Assistant Sales Manager, St. Joseph Lead Company, New York City, has been appointed Sales Manager succeeding **Irwin H. Cornell,** retired after 38 years of service with the company.

F. M. Barry is now Director of Metals Research of Scovill Manufacturing Com-

Start Clean and It'll Finish Clean

Start right—by keeping your solutions clean. For magic results, use Darco S-51. Darco S-51 adsorbs—eliminates—those impurities that get past the mechanical filter. Used in conjunction with a filter, Darco provides solutions that mean trouble-free work in bright nickel—copper—iron—zinc—cadmium—tin—gold and silver. Darco is especially easy to handle—easy to wet and quick to incorporate into the slurry. Inexpensive, too—a few cents' worth will purify 100 gallons of solution a week.

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3. All Iron for alkaline solutions
4. All Steel (with Stainless Pump) for chromium

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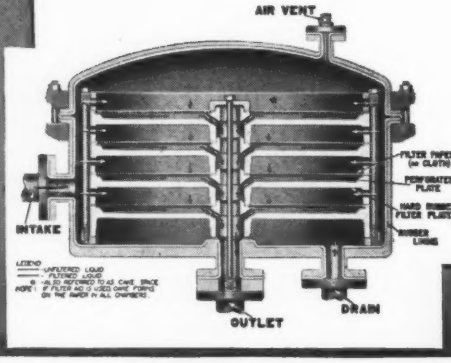
Mundelein, Illinois



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Our Engineering Service is available for any specialized problems.

Personals

pany, Waterbury. He succeeds W. B. **Price,** recently retired, who was elected to Honorary Membership of American Society for Testing Materials at its recent Annual Meeting.

A. H. Losey, who recently joined the Frederic B. Stevens organization, has been named manager of its Cleveland office, in the Fidelity Building, 1940 E. Sixth Street, Cleveland, Ohio.

Mr. Losey has spent twenty-three years in the electroplating and metal finishing industry. He was formerly employed in supervisory capacity by both

Losey

the National Brass Company and Winters & Crampton of Grand Rapids, Mich. Later on, he joined forces with J. C. Miller Company of Grand Rapids as Sales Engineer. From there, Mr. Losey went with the Hammond Machinery Builders of Kalamazoo, Mich., in the same capacity. Just prior to his affiliation with Stevens, he owned and operated the Kenart Manufacturing Company in Kalamazoo, where he sold equipment and supplies and conducted a job plating shop.

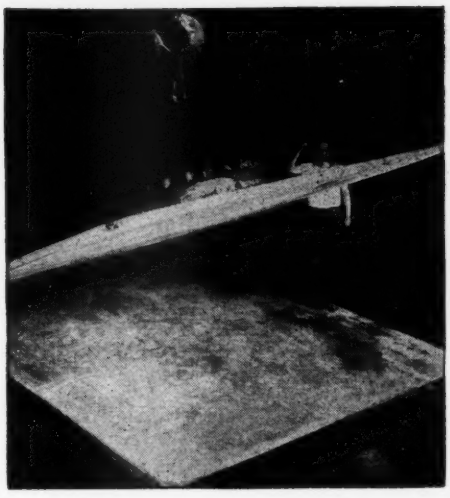
Savage

Frank K. Savage announces that he has severed his connection as Vice-President of the Standard Plating Rack Company of Chicago, Ill.

Warren Jennings, Vice-President in charge of the Boston office of Minneapolis-Honeywell Regulator Company and its sub-branches, has expressed a desire to be relieved of some of his more exacting responsibilities after 35 years of service with the company. He will continue as Vice-President, and his advice and counsel will be available not only to New England but also to the entire eastern region.

J. C. McKenna, for the past six months Product Manager of Chromium Chemical Sales for Diamond Alkali Company,

Lukens Steel Company Uses G-E Copper-Oxide Rectifiers with Precision Control for Plating



Controls — conveniently located on panel next to tank — give operator finger-tip voltage control. Pressing RAISE or LOWER buttons increases or decreases voltage instantaneously to desired value.

Bank of General Electric copper-oxide rectifiers and automatic "on-load" control maintain selected voltage within ± 2 per cent of selected value.

The electrolytic plating of nickel on stainless and Inconel is a closely controlled process in the manufacture of Lukens Stainless-Clad and Inconel-Clad steels. These clad steels depend upon this plating to insure adequate bonding of these corrosion-resistant metals to the steel backing plates. After preliminary assembly, hot rolling permanently bonds the components and reduces the thickness to prescribed dimensions.

Utilizing a total of 16,000 amperes, the Lukens plating plant carries out this heavy-duty operation with 12 General Electric copper-oxide rectifiers, controlled by General Electric automatic "on-load" controls. Maintaining voltage with an accuracy of ± 2 per cent, these controls keep constant watch over all operations. For easy maintenance, all rectifier units are located outside the plating room; for easy operation, push-button controls are located right at the tanks.

When you're thinking of modernization, think in terms of convenient, automatic control. A typical automatic unit — consisting of a General Electric "2000" copper-oxide rectifier, an operator's control box, and an automatic induction-type "on-load" control — handles 12 kw with push-button flexibility, precision voltage control. Combinations of G-E "2000" rectifiers — or other General Electric models — can be made to give you exactly the power you need, with the fine control you want.

Why not look into the benefits — and savings, too — of a completely automatic General Electric copper-oxide rectifier "package." Write us for information, or ask to have a representative call. Section A2-1058, General Electric Company, Bridgeport 2, Connecticut.

GENERAL ELECTRIC

Personals

Cleveland, Ohio, has been named Product Manager of Alkali Sales. He succeeds **J. D. Mattern,** who retired in mid-August after 25 years' service with the company to make his home in San Diego, Calif. McKenna's successor is **Charles E. Grant,** assistant to the president of the Martin Dennis Company of Newark, N. J., since this manufacturer of chromium chemicals was acquired by Diamond earlier this year.

McKenna, who is forty-eight and hails from New York, has been associated with the company for twenty-six years and enjoys a wide acquaintance among users of soda ash, caustic soda, bicarbonate of soda and related chemical products. He attended Fordham University and City College of New York.

Grant, who is thirty-six, joined the company at Painesville in 1945 as a project engineer, and in March of this year was promoted to the Martin Dennis organization. His previous experience includes service over a 10-year period in various engineering capacities with the Quaker State Oil Refining Corporation of Oil City, Pa., at its Emlenton (Pa.) refinery; Manufacturers' Light and Heat Company, Pittsburgh, Pa.; Bastian-Blessing Company, Chicago, Ill.; and the Weatherhead Company, Cleveland. He studied engineering at Pennsylvania State College.

Eugene L. Combs has become associated with Wyandotte Chemical Company, Cleveland, Ohio. Formerly with Kight Advertising, Inc., of Columbus, Ohio, he has been an active member and served as Librarian of the Columbus Branch, A. E. S. He also has been Editor-in-Chief of C. T. C. News, the monthly publication of Columbus Technical Council.

Dr. John Kronsbein has accepted a professorship at Evansville College, Evansville, Ind. Having been with Hoosier Cardinal Corporation of Evansville since his return from England less than a year ago, he is known in plating circles especially for his mathematical studies of current distribution during electrodeposition.

Lynn A. Saylor has been appointed Advertising Manager of The Diversey Corporation, it was announced by W. E. Noyes, General Sales Manager.

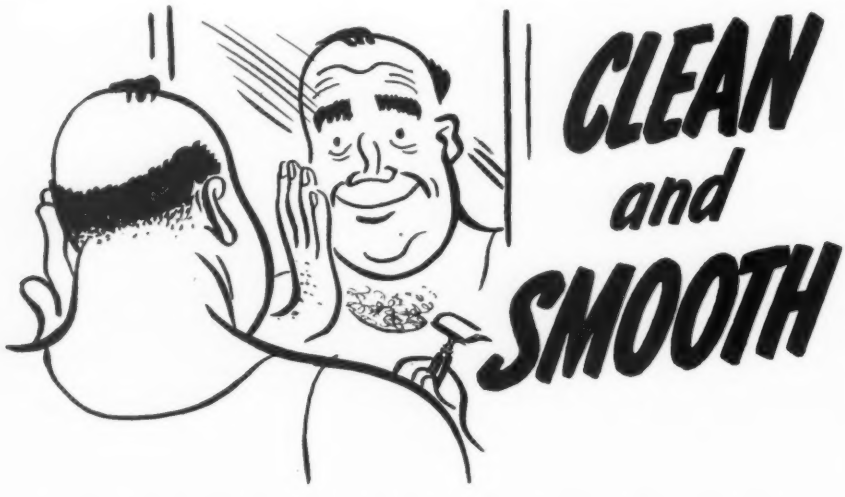
Mr. Saylor has a wide advertising background, having held similar position

Saylor

with such major organizations as Mystik Adhesive Products; Ingersoll Steel Division of Borg-Warner; Hotpoint, Inc., Division of General Electric; and Certain-Teed Products. He will handle all of the advertising for Diversey, nationally known for its specialized line of alkaline cleaners.

Dr. D. P. Morgan, who recently joined Mathieson Chemical Corporation as Administrator of Research and Development, has been appointed Vice-President in charge of the Development Department.

Before coming to Mathieson, Dr. Morgan was in charge of chemical market research and development at W. R. Grace and Company. During the last several years of World War II, he served as Director of the Chemicals Bureau of the War Production Board. Prior to that he was associated with Scudder, Stevens and Clark as a chemical consultant. Dr. Morgan is a graduate of Harvard University and received his Ph.D. in chemistry from Columbia University.



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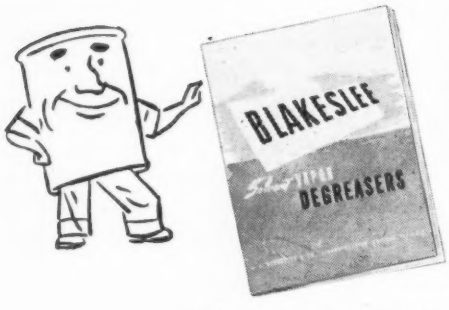

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Blakeslee Solvent Vapor Degreasers employ a patented degreasing process . . . parts made of metals and alloys chemically cleaned and dried in only a few seconds . . . no need for subsequent rinsing and drying operations. Oil and grease-free surfaces are obtained, complete oil removal from cracks, pores, seams and hidden crevices of machined parts, stampings, assemblies, etc., is assured. Masses of nested parts are thoroughly cleaned and dried throughout.

In this cleaning process, the oils and greases are dissolved by BLACOSOLV, the efficient degreasing solvent which can be used on all metals or combinations of metals. BLACOSOLV is non-inflammable and non-explosive. It can be heated, without danger of any fire hazard. Just one solvent at one price will do the complete degreasing job.

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Personals

Roman C. Bender has joined the sales organization of Frederic B. Stevens, Inc., of Detroit, Mich.

Mr. Bender has been connected with the plating, polishing and finishing industries for almost a quarter century. He was formerly Plating Superintendent with Clum Manufacturing Company of Milwaukee and Adams and Westlake Company of Chicago. Later he acted as sales

Bender

representative for The Egyptian Lacquer Company. Prior to joining the Stevens Organization he owned and operated the Chicago City Plating Company. He now represents Stevens in Indiana and Kentucky.

Mr. Bender is a very active member since 1932 of the American Electroplaters' Society. He also belongs to the Electrochemical Society.

C. Kelly, formerly Superintendent of Acme Electroplating Company, Chicago, Ill., is now Assistant to the President of the Driscoll Company of the same city.

Kelly

A leader in the American Electroplaters' Society, he was a member of its Constitution Revision Committee, 1947–1948. He served as President of its Chicago Branch in 1946–1947 and is now a member of its Board of Managers.

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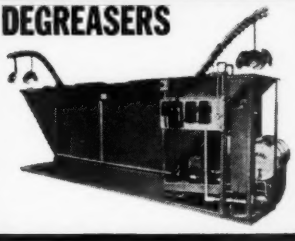
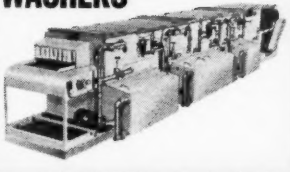
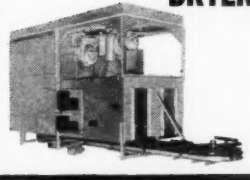


WASHERS



DRYERS



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OPTIMUS METAL PARTS WASHERS — single or multiple stage — screw or conveyor, mesh belt or monorail types. Can be applied to a wide range of operations as well as the handling of rust preventatives and other coatings.

OPTIMUS DRYERS embody a specially designed system of directional air jets which assure spotless drying after plating or polishing and before subsequent painting, plating or lacquering.

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All subsequent cleaning operations are reduced to a minimum by using K W alkaline cleaner and SOAKLEEN emulsion type cleaner together in the pre-soak operation. These two fast acting, efficient and economical cleaners do a real job of removing oils and stubborn soil when used in combination.

K W Cleaner alone will handle all cleaning operations after the soak cleaning. It can be used in still tanks—with or without electric current—and in all standard washing machines.

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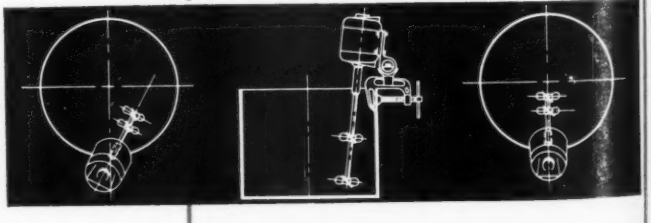

Left illustration shows the proper position for Mixing Shaft to give thorough mix without drawing air into the liquid.

Center illustration shows the normal position of shaft for general mixing.

Right illustration shows shaft in vortex position for drawing light powders, etc., into liquid.

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Editorial

October 1948

PROPRIETARY MATERIALS AND TRADE DESIGNATIONS

THE RAPID GROWTH in the electroplating and allied fields of new processes and products has led to increased employment of proprietary materials of composition unknown to the user. Contributive causes may have been the reluctance of the Patent Office during the past several years to grant patent claims of broad scope and the many difficulties, legal and cost-wise, encountered in getting patents sustained in the courts. Whatever one may think of this development, it seems a propos to consider one of its by-products, the trade designation, the significance of which is not always realized by either supplier or user.

To begin with, a distinction may conveniently be made between trade name or trademark on one hand and trade designation on the other. The former has for its function to define the origin or manufacturer of a material; as a manufacturer continues to put out good merchandise, a product with his trade name or trademark becomes especially desirable. The latter serves to distinguish one material from another and often consists of a prefix or suffix of some kind to the trade name or trademark.

In the nature of things, therefore, each trade designation should apply to one material only and not to several, be they ever so similar. When a change is made, for any reason whatever, the designation should be changed, if only by adding a letter or number or changing the previous letter or number.

The most common reason for a change is the desire to improve the product. At times, however, it results in bettering one or more properties at the expense of another, not known or believed to be important. If it turns out to be significant and no change in designation has been made, the user is likely to get into difficulties for which he has no explanation; when after too long a time he finds out why, if not before, the supplier too is likely to find himself in hot water. Another common reason is the scarcity or high cost of a particular ingredient. A substitute is used, and the same kind of difficulty is experienced again.

A change in the trade designation might have eliminated the difficulties altogether or at least in part. The user who knew his requirements better than the supplier could have caught the deficiency before it caused trouble or, when it happened, could have put his finger on the reason much easier. He certainly would not turn to a competitor for a more reliable material.

Most smart suppliers not only change the designation but inform their customers beforehand that a change will be made and let them have enough of the new material to try out and approve. The smart buyer, on the other hand, having approved a material for his use, obtains the assurance that no changes, however insignificant, be made without his knowledge.

Many and perhaps all real objections to proprietary materials would disappear if the suggested courses were adopted more generally.

Gustaf Soderberg

Corrosion Resistant Cements and Plating Room Practice

V. A. CURLL

Technical Advisor, Special Chemicals Division

Pennsylvania Salt Manufacturing Company, Philadelphia, Pa.

Introduction

Any connection between the selection or use of corrosion resistant cements and plating room practice may appear remote on first thought, but on investigation it is readily seen that these two subjects are interdependent.

Whether the plating shop is run by one or two operators with the simplest equipment or plating operations are conducted on a large scale with high investment in a number of automatic machines, corrosion resistant cements are virtually a necessity. This is true because a complete plating cycle which does not include at least one corrosive solution has yet to be developed and ordinary types of cement are rapidly destroyed in such service. The role of suitable protection is realized whether it be for preventing loss of solutions or avoiding contamination or for handling of industrial wastes or spillage without destructive attack on floors, drains, sump or neutralization pits.

A sometimes less obvious fact, but one which may affect the operations of the entire shop, is that improperly selected materials of construction can not only cause serious delays and interruption of production until repairs or replacements have been completed but also interfere with the profits of the company and thus affect the company's employees and its representatives.

Applications

A number of corrosive solutions must be handled even with the use of the simplest plating cycle, and it is well to remember that dilute solutions are often more severe than concentrated ones in their attack on some materials of construction. All the usual electroplating cycles make use of considerable volumes of water which is nearly always contaminated with acids, alkalies or solvents. The plating baths, which themselves are acid or alkaline, are preceded by an acid activating dip or pickle for scale removal. Alkalies and solvents are employed to remove a wide variety of soils such as grease and oils and compounds for drawing, cutting, polishing and buffing. Corrosive etching, brightening, passivating, and neutralizing solutions are in widespread use. Further complication of the problem of selecting the proper protective materials may result from the reaction of the cleaners with the surface deposits. Many shops take advantage of the fact that waste alkalies react with spent acids to form neutral salts or easily separable precipitates whereby the water is put in a disposable condition, but even here there remains the problem of constructing drains, sewers and holding pits which will collect and handle these wastes without deterioration. Both ferrous and non-ferrous alloys are adequate in the construction of much plating room equipment, but acid-proof brick, carbon products, and tile, bonded with a properly chosen cement, have an undisputed place.

The individual tanks or containers in a plating cycle must be constructed of materials which will give service without becoming eroded and without contributing contamination, and although in many cases their selection is difficult, this problem is relatively elementary compared to floor and drain construction.

Corrosion-resistant cements are employed in the plating shop only in those tanks which will be used for handling acidic baths. Tanks employed for solvents, emulsions or alkalies are generally steel, preferably protected on the outside from atmospheric corrosion, maintenance cleaning, and accidental splashing with a corrosion-resistant paint or coating. These tanks, like the others in the cycle, should be raised from the floor to permit ventilation and periodic inspection and painting.

Floor of acid-proof brick buttered on five sides with Pennsalt Causplit Cement and laid over concrete with two-coat mastic membrane in between. Handles spillage and discharge from alkaline cleaning and sulfuric acid pickling tanks

Portland Cements

Construction with acid-proof brick and well vitrified tile in the plating room is rapidly gaining widespread popularity as these materials are not affected by acids, alkalies, or solvents. It is well known that Portland type cements and even those containing special admixtures which decrease the inherent porosity and thus reduce the rate of attack, are subject to rapid destruction by acids and to a somewhat slower disintegration by alkalies and certain solvents. This has been the practical although disheartening and costly experience of many shops. From the chemical standpoint it can be readily appreciated that ingredients such as calcium hydroxide are converted to soluble salts as a result of contact with many plating room solutions. Portland cements are invaluable materials of construction both in the form of cast concrete and for bonding brick and tile when their use is confined to areas not subject to attack by corrosives. In other areas, dilute acid or alkaline solutions or even the occasional spillage of plating, pickling, or cleaning baths are capable of dissolving, softening, and disintegrating the calcium hydroxide binder and even the sand and crushed stone in the concrete.

Needless to say, there is considerable difference in the service life that may be expected of acid-proof brick manufactured by a reliable company and the ordinary building brick or tile, making the choice of a suitable brick or tile for the anticipated service far easier than selecting the proper bonding material.

Cement Joints

Brick tank linings, drains, or floor sheathings are of little use if the cement softens, dissolves, has an appreciably different coefficient of expansion, or loses its high-adhesion characteristics in service. The cement joints are usually more vulnerable to destructive attack than the brick. It is, therefore, an advantage, from the standpoint of corrosion protection, to make them as thin as possible to minimize the exposed surface area and, from consideration of cost, to reduce the quantity of cementing materials required. Many manufacturers of corrosion-resistant cement recommend that surface joints of their specialty cements be from 1/8 to 1/16 inch wide. Thus, for floor construction with a standard nine-inch acid-proof brick there is exposed to the corrosive solutions roughly forty times more brick surface than acid-proof cement surface.

Corrosion-Resistant Cements

When the electroplating industry was in its infancy, it was common practice to use Portland type cements for much construction which is now done with special corrosion-resistant cements. The war years, with their delays in obtaining delivery of both parts and process materials, have emphasized the importance and cost effect of any delay on the plating room output. Instead of interrupting the entire shop for yearly or more frequent replacement of tanks, floors and drains, the plating industry is now choosing such materials which will give years of uninterrupted service. The heavy-

chemical and steel industries have judiciously used suitable cement products in a wide variety of construction work for the last twenty years; the results of their experiences have pointed the way to permanent construction for the electroplater who is constantly improving his shop practice and expanding his plant.

The plating shop that expands existing facilities for additional production is particularly fortunate if no process changes are required and it has already had good service from a previously correctly chosen corrosion-resistant cement. With the constant improvement of plating baths, changes in pickling practices, alteration of techniques, and more stringent waste water regulations, however, the problem of selecting a serviceable bonding material for brick or tile is usually different than in the original construction. Those shops which have not had previous experience with corrosion-resistant cements should turn the selection over to a reliable manufacturer. Even those who have used such cements previously would do well to follow this same procedure. The following factors are among the most important and may spell the difference between a trouble-free installation, giving a long period of service, and failure within a few months:

1. Types of solution—the particular acids, alkalies, and/or solvents
2. Anticipated concentration of corrosives
3. Range of service temperature
4. Type of maintenance cleaning—chemical or with absorptive materials
5. Type of sub-floor or kind of tank or drain shell which will be lined
6. Unusual abrasion or wear by movement of liquids or heavy traffic over the surface
7. Kind of membrane between brickwork and shell or sub-floor
8. Manner of heating solutions and degree of aeration

In the planning of acid-resistant construction work and the selection of a suitable cement it is imperative that all conditions be known. While there are cements which are resistant to almost all solutions and service conditions, it must not be assumed that one of the so-called "all purpose" type cements will be satisfactory for all constructions.

Sulfur Cement

The three major classifications of cements suitable for many of the uses in the plating shop are (a) silicate types, (b) synthetic resin types, and (c) sulfur types. The first two, due to their ability to be repaired easily and their ample temperature safety factor, are the most widely used. Then, too, less silicate or resin cement than sulfur cement is required per square foot of brickwork. All three types, in general, are highly resistant to chemical attack, with the sulfur based products being recommended for stainless steel pickling baths and aluminum dips of mixed nitric-hydrofluoric acids. With this one exception, all corrosion construction work in the electroplating shop can be handled adequately with either the proper silicate type or resin type cement. The choice may thus be reduced to one between a quick-setting sodium silicate product or one of the phenol-formaldehyde resin cements.

Silicate Cements

Silicate cements of the air-drying type were first developed in Europe, and long strides were taken both there and in this country in replacing the wooden acid pickling tub. These products consisted of a mechanical mixture of sodium or potassium silicate solutions with inert filters such as ground quartz, sand and clay. Hardening of the mortar was accomplished by removal of the water by evaporation and heat, followed by an acid wash or preferably an acid soak prior to use. Thin joints could be made easily with the paste-like mortar, but construction was slow and the weight of the upper courses of brickwork tended to squeeze nearly all mortar from the joints, a difficulty often accompanied by the bricks "floating" out of place, making the walls bulge. In addition, some of the joints not exposed to air or acid solutions never thoroughly hardened but remained soft, giving little bond to tank shell walls.

While some air-setting silicate cements still are being employed today, their use is restricted and they have been replaced largely by chemical or quick-setting silicate cements. It is no surprise that these self-hardening silicate bonding materials also were developed in Europe, but their full development and improvement have been brought about by the several manufacturers in this country. A decided advance over the original silicate cements, they consist basically of specific silicate solutions that are mixed on the construction site with a cement powder which has mixed or compounded with it predetermined quantities of setting or hardening agents. The powder consists of graded fillers or plasticizers which usually are silica in various sizes, not only to prevent segregation and give good workability but also to result in the greatest possible density and freedom from chemical attack on the cement. The chemical reaction, which takes place in approximately twenty minutes after mixing the powder and solution, causes the mortar to harden. Thus, the advantages of the air-drying cements are retained and the disadvantages replaced with real benefits to the user. Of particular interest to the plater is that the chemical hardening cements are definitely more resistant than the air-setting types to attack by dilute acid such as is encountered on shop floors and in drains. They are unaffected by hot or cold acids in all concentrations, with the exception of hydrofluoric acid, and certain silicate cements do not lose strength at temperatures below 1800° F. Certain quick-hardening silicate cements, however, are water soluble, and none of them are suitable in alkaline service.

The ordinary mason's trowel is used for buttering or spreading the chemical-hardening cement mortar on the back and sides of each brick. The brick is then

tamped or squeezed tightly into position to make all cement joints 1/8 to 1/16 inch thick. Excess mortar forced out with any air bubbles is immediately removed from the surface of the joint and used on the next brick. For work involving considerable construction, small mechanical mixers are available which not only give a uniform mortar but ease the labor of its preparation. With such a device it is also easier to mix into the solution the proportion of powder required, in strict adherence to the manufacturer's instructions. The mortars should not be diluted with additional sand or gravel. They should not be considered for service as coating or casting materials over large areas because the slight inherent shrinkage on hardening will set up internal stresses that may result in cracking and ultimate failure.

Silicate cements must never be applied directly to any alkaline surface such as Portland cement or concrete since the alkali will react with the fresh silicate mortar and prevent hardening. A sub-floor, drain, or tank shell of concrete must be provided with a separating impervious membrane to prevent contact with the silicate cement. Lead, rubber, and, in certain cases, asphalt are standard membrane materials, and some of the newer plastics and corrosion-proof paints are giving excellent service. A second course of brick may be bonded with the same cement without the necessity of a separating membrane. In the case of a two-course lining the joints should be staggered or "broken" by the second course wherever possible. The number of courses of brickwork or total brick sheathing required is dictated by various factors such as height of sheathing, service temperature and desired thermal insulation.

Quick-setting silicate cements are giving outstanding service in plating shops, as a joining material for bricks in linings for pickling tanks (e. g., with muriatic, sulfuric, and nitric acids), plating tanks (chromic, nickel, and acid copper), open drains, floors, pits, or sumps, or for sewer tile when they are subjected to acid conditions only.

Synthetic Resin Cements

Synthetic resin cements, like the chemical-hardening silicate bonding materials, are prepared by mixing a dry powder into the resin solution. Also like the silicate cements, the powders are composed of filler materials and controlled quantities of hardening agents which are inert to the corrosive solutions. Hardening or solidification of the mortar occurs in three to six hours at room temperature; the rate of set can be controlled by adjusting the temperature. Several types of powders and resin solutions are available which permit continuous satisfactory service in acids, alkalies, and solvents. A resin solution of the phenol-formaldehyde type was the logical choice for corrosion-resistant cement work since the outstanding ability of such resins to withstand chemical, mechanical, and thermal disintegration was well known. Improvements led to the use of resins of this classification that are unaffected by strong alkaline solutions, and further refinements in formulation and selection of raw materials give high resistance to solvent action. Thus, the present day resin solutions which react chemically with selected powders produce bonding materials that are unaffected by almost all types of chemical attack.

Although the synthetic resin cements will give excellent service in many acids such as muriatic, hydrofluoric, and sulfuric acid, in alkalies such as caustic soda, trisodium phosphate, and specialty alkaline cleaners, and in solvents like acetone, alcohol, and carbon tetrachloride, they are basically organic materials and as such subject to attack by certain solvents and by strong oxidizing agents, e. g., nitric and chromic acids. Before making a definite choice of bonding material it is always advisable to confer with the cement manufacturers.

The synthetic resin cement mortars are handled in the same manner as the quick-setting silicate mortars. They are often used for pointing or as surface filling materials for brick previously laid in a Portland cement grout. The recess or open joint is usually recommended to be rectangular in cross-section, 1/4 inch wide by 3/4 inch deep. After it has been treated by washing with dilute muriatic acid to neutralize the alkali in the Portland cement joint and complete drying, the resin mortar is used to fill the entire open joint.

Since these cements are impervious to penetration by liquids and resist most acids, water, steam, oils, alkalies, and solvents, they are important contributing factors in making permanent the constructions in the plating room. They have been used extensively for floors, walls, tanks and drains. They are, in addition, unusually satisfactory under conditions of abrasion or washing action and will not spall, warp, or crack due to sudden thermal shock up to temperatures of 375° F.

Conclusion

The plating shop superintendent who was responsible for the accelerated production during the last seven or eight years will readily testify that freedom from frequent repairs to tanks, drains and floors not only eliminated many of his worries but proved to be a sound investment as greater production was possible through continuous operation. Many such installations are giving trouble-free service after ten or twelve years' use because of proper selection of brick and cement.

Although more expensive in initial cost than Portland cement and ordinary building brick, the depreciation rate for properly chosen corrosion-resistant construction materials is much less as the cost can be spread over an appreciably longer period. Added to this are the benefits to be obtained by a minimum number of repairs. Thus, the practice of the plating shop can often readily be improved by attaining protection of the equipment through the use of a cement carefully selected for the particular installation.

Louis Weisberg

LOUIS WEISBERG, Consulting Chemist in New York City and recently elected Chairman of the Research Committee of the American Electroplaters' Society, is a physical chemist whose interest in electrochemistry gradually led him into electroplating where he now occupies an honored place.

Dr. Weisberg was born in Dallas, Texas, on January 13, 1891 and spent his boyhood in the cotton belt where the only white Republican was the postmaster. After graduating from Waco High School, he studied for four years at the University of Texas and then for three years at Massachusetts Institute of Technology, where he earned his degrees, B.A. in 1912 and Ph.D. in 1915.

Having made "easy" dyestuffs, cut off by World War I, with a struggling firm, he soon joined the Scoville Manufacturing Company in Waterbury, Conn., as research chemist. While he had nothing to do with the plating department, he saw there his first good-sized plating plant and was amazed at the keen powers of observation displayed by one of the tank men. There he also met George B. Hogaboom, who impressed him by his ability to straighten out whatever had gone wrong, and to him "the wonder grew that one small head could carry all he knew".

After a year in Paris with the Chemical Warfare Service, in which he rose from Pfc. to 2nd Lieutenant, he worked for a while as physical chemist in the Color Laboratory, U. S. Bureau of Chemistry, Washington, D. C. He then went to work in The Barrett Company's Research Laboratory in Shadyside, N. J., and soon had charge of its Experimental Plant Division.

In 1921 Dr. Weisberg threw caution to the winds and put out his shingle as consultant. In 1925, when chromium plating appeared on the horizon, he read Sargent's article and became a chromium plating expert, a not too difficult feat in those days. Chromium led to nickel, nickel to copper, and so on to a wide experience with most metals of importance in electroplating. Bright nickel and copper, electroforming and production of metal powders followed.

While best known for his bright nickel-cobalt and bright copper baths, Weisberg regards his chief contribution to the plating field methods for keeping solutions operating without interruption by means of continuous purification.

Dr. Weisberg has been active in many technical societies besides the American Electroplaters' Society: the American Chemical Society, the Electrochemical Society, the American Institute of Chemical Engineers, and the Chemists' Club. He is also a fellow of the American Institute of Chemists and a former director and president of the Association of Consulting Chemists and Chemical Engineers.

His principal hobby is music, along rather classical lines and as listener. His claims to performing virtuosity are limited to the twirling of the dials of his Scott.

DEPLATING WITH VOLTAGE CONTROL

J. B. MOHLER

Director of Research, The Johnson Bronze Company, New Castle, Pa.

DEPLATING, OR ELECTROLYTIC stripping, can be easily applied for the removal of metallic coatings from a basis metal when the coating is more active in the electrolyte under the influence of anodic current than the basis metal. This means that an electrolyte must be chosen such that this condition is met.

By the selection of sodium cyanide as the electrolyte copper can be stripped from iron or steel, whereas the selection of hydrochloric acid would enable the stripping of iron from copper. In the latter case the current would, at low voltages, confine itself to the iron until it had been removed, and then the copper would be attacked. Such a system requires close control to avoid undue attack of the basis metal, but under proper conditions the system is practical and it has been applied for stripping of tin coatings from bronze.

The case of stripping cyanide-soluble metals from steel in cyanide solutions is more interesting in that the steel acts as a noble metal and is substantially free from attack when used as an anode in the cyanide system. Experimental work has been carried out to show the effect of various additives and of variation in electrolyte composition on bath stripping rate and bath life[1].

After an electrolyte for deplating has been chosen, the practical limits on operating conditions can be easily established by determining voltage-amperage curves for the two metals concerned. This is done by measuring the tank voltage at various current densities, using each metal separately as an anode and a convenient cathode.

The graph in Fig. 1 shows data taken with 4 x 4 inch steel and copper anodes and a 4 x 4 inch cathode, spaced 4 inches apart, in a small cell containing a solution of 40 g/l sodium cyanide. From this graph the method of operation can be deduced.

The curves for steel and copper are typical. Oxygen begins to evolve from steel at an extremely low current density, the point of inflexion at about 1.7 volts being the point of oxygen overvoltage. The remainder of the curve approximates a straight line and shows that the electrical characteristics approximately follow Ohm's law during gas evolution, the slope being about 0.6 volt per 10 asf.

At low current densities the curve for copper is similar in shape to that for steel, but since it begins at near zero volt, it represents dissolution of copper at high efficiency. As the current density is increased, a point of beginning excessive polarization is reached at about 25 asf where the voltage increases more rapidly than before with increase in current density. This is due to the formation of heavy anode films of low porosity which tend to insulate the copper from the solution.

The points on the curves corresponding to a cell voltage of 2 volts represent current densities of approximately 1 asf for the steel and 23 asf for the copper. At 2½ volts is where excessive polarization of the copper begins. At 4 volts the current density is 30 asf for both copper and steel.

From the curves it can be seen that the proper operating current density for the copper is 20 to 25 asf. Above this, excessive polarization begins, oxygen will be evolved with rapid decomposition of the cyanide, and the current density will decrease with time as the thickness of the anode film builds up. Operation in this range not only is economic but results in more

(Continued on page 1044)

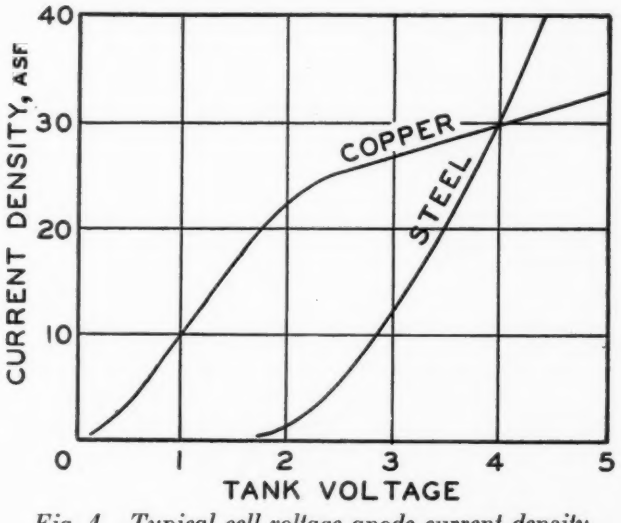

Fig. 1. Typical cell voltage anode current density relationship for copper and steel anodes in cyanide deplating solution

Conversion Data for Brass Solutions and Deposits

The following data have been compiled to assist the brass plater in preparing and maintaining his rather complex brass and "bronze" plating solutions.

Some texts express bath compositions in terms of normalities. Conversion factors which give grams per liter and ounces per gallon are presented in Table I. The footnotes to this table provide a variety of other useful factors.

Fig. 1 in a direct-reading chart which ties together the common expressions for ammonia content. For example: 1.25 fluid ounces per gallon of 28 per cent ammonia is equivalent to 10.9 milliliters per liter or 40 milliliters per gallon of 28 per cent ammonia or 2.72 grams per liter of ammonia (NH_3).

Fig. 2 serves to convert copper-zinc ratios into percentage composition and vice versa. For example, an alloy of 4:1 composition contains 20 per cent zinc and 80 per cent copper.

Fig. 3 shows how at 100 per cent cathode efficiency the number of ampere-hours required per square foot and the number of grams deposited per ampere-hour varies with the percentage of copper in the coating. For example, an 80 per cent copper (−20 per cent zinc) alloy requires 9.7 ampere-hours per 0.001 inch thickness and each ampere-hour deposits 1.54 grams. At a lower efficiency, the results must be divided by the efficiency. For example, at 80 per cent efficiency 9.7 is divided by 0.80 and becomes 12.2 ampere-hours per mil; similarly 1.54 becomes 1.54/0.80 = 1.92 grams per ampere-hour.

TABLE I. CONVERSION OF NORMALITY OF BATH COMPOSITION TO WEIGHT PER VOLUME MEASURES

Constituent	Formula Weight	g/l	oz/gal
Copper (ous)	63.6	31.8	8.5
Zinc	65.4	32.7	4.3
Copper cyanide*	89.6	89.6	12.0
Zinc cyanide†	117.4	58.7	7.8
Sodium cyanide‡	49.0	49.0	6.5
Sodium carbonate	106.0	53.0	7.1
Ammonia, NH_3	17.0	17.0	§
Ammonium hydroxide, NH_4OH	35.0	35.0	§

*Copper in copper cyanide = 70%
1.43 x weight of copper = weight of copper cyanide equivalent
0.77 x weight of copper = weight of sodium cyanide equivalent to the cyanogen in copper cyanide

†Zinc in zinc cyanide = 55%
1.82 x weight of zinc = weight of zinc cyanide equivalent
1.5 x weight of zinc = weight of sodium cyanide equivalent to the cyanogen in zinc cyanide

‡1.1 x weight of copper cyanide = weight of sodium cyanide required to dissolve the copper cyanide and form complex sodium cuprocyanide $Na_2Cu(CN)_3$
0.83 x weight of zinc cyanide = weight of sodium cyanide required to dissolve the zinc cyanide and form complex sodium zinc cyanide $Na_2Zn(CN)_4$
2.31 x weight of copper = weight of total sodium cyanide equivalent to the cyanogen content in complex sodium cuprocyanide
3.0 x weight of zinc = weight of total sodium cyanide equivalent to cyanogen content in complex sodium zinc cyanide

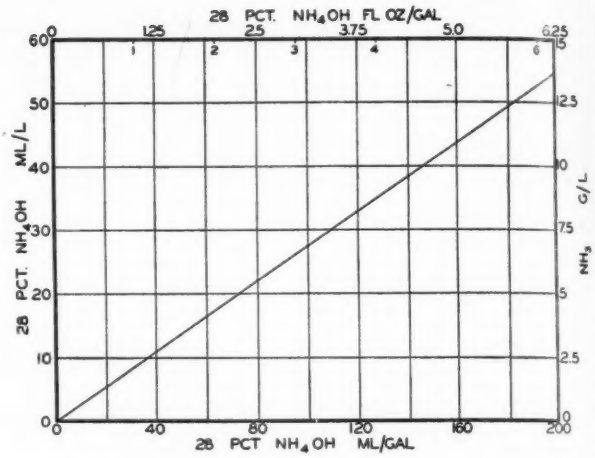

Fig. 1. Conversion chart for ammonia concentrations

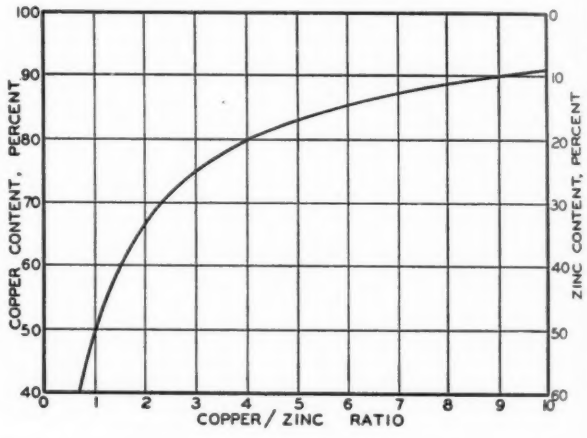

Fig. 2. Copper and zinc percentages at various copper-zinc ratios

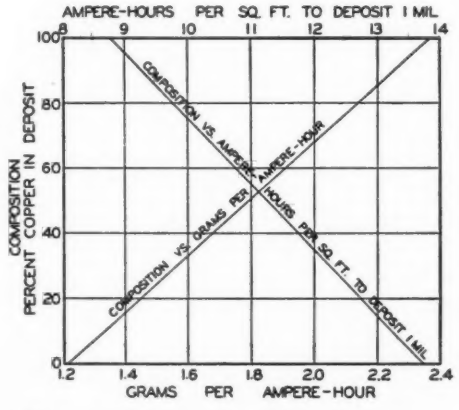
AMPERE-HOURS PER SQ. FT. TO DEPOSIT 1 MIL
COMPOSITION PERCENT COPPER IN DEPOSIT
COMPOSITION VS. AMPERE-HOUR
COMPOSITION VS. GRAMS PER AMPERE-HOUR
GRAMS PER AMPERE-HOUR

Fig. 3. Electrochemical equivalents in the deposition of brass and "bronze" alloys at 100 per cent efficiency

§Commercial (aqua) ammonia is 28% NH_4OH
1 ml/l 28% NH_4OH = 3.78 ml/gal = 0.25 g/l NH_3 = 0.0147 normal
1 ml/gal 28% NH_4OH = 0.264 ml/l = 0.066 g/l NH_3 = 0.0039 normal
0.1 normal NH_4OH or NH_3 = 6.8 ml/l or 25.7 ml/gal 28% NH_4OH

A. E. S. . . . and how it began

Looking around during the recent A. E. S. Convention, the Editor was suddenly struck with the fact that such men as Ed Faint, John Feeley, George Hogaboom, Frank Mesle and Horace Smith stood out from the crowd in a different way than before. They represented a generation of pioneers that only a few years ago was very active in Society affairs but now has almost disappeared from sight by retirement or death. Time has certainly taken its toll of those who can speak of the early days from their own recollection.

When shortly afterwards George Hogaboom sent him some notes about those days and in a letter pointed out how legend already distorted some of the facts, the Editor felt moved to expand those notes into the following short article. It is hoped that those of the younger generation who have the Society's welfare at heart will take note of the fruit borne by the enthusiasm of a few devoted men and feel inspired to follow in their footsteps.

CHARLES H. PROCTOR . . . *Founder and first President of the National Association of Electroplaters.*

GEORGE E. HOGABOOM . . . *first President of the American Electroplaters' Society*

NEW YEAR'S DAY, 1909, marks the humble beginning of the American Electroplaters' Society. On that day Charles H. Proctor, Plating and Foundry Supervisor with F. H. Lovell Company, Arlington, N. J., addressed a letter to several electroplaters requesting their support on organizing a society of electroplaters. This letter, which was published in the January issue of *Metal Industry* (now *Metal Finishing*) of which Mr. Proctor was a staff writer, read in part as follows:

"I have been deeply interested in the controversy over the cleaning of nickel anodes and have read both sides of the discussion with much relish. I am sure this discussion proves that once in a while the plater will come out of his shell and expose himself, especially when there is danger of some of his own exclusive thoughts and pet theories becoming overthrown in the light of publicity. Such discussions as these are what we need. This is the very reason why today we need an association of platers, national in its scope. This is also why two years ago in an address before the newly formed American Brass Founders' Association in Philadelphia, I mentioned the fact that a national association of platers was necessary.

". . . the American Brass Founders' Association is going forward rapidly. Its membership is constantly increasing and it is accomplishing results by the interchange of thoughts and ideas that have proved instructive and beneficial to its members.

"Well, Mr. Plater, what are you going to do . . .? You have a thinking mind. Don't you think it is about time you thought of an association that would be national in its scope? Not for you alone nor me, but for the welfare of us all. As a great factor in the industrial and commercial arts, are you not worthy of such an association? I am ready to do my part; are you ready to do yours?

"It takes money to accomplish some things. I have a dollar or two for this cause. How much have you? Unlike the American Brass Founders' Association, we have no rich Iron Founders' Association to support us; we must stand alone. What do you say? The Metal Industry, I have no doubt, will be pleased to receive communications upon this subject".

The February issue contains a letter signed by Percy S. Brown of New York City, one of the parties to the nickel anode controversy, which is said to voice the opinions of all those who replied to the invitation. The first two paragraphs read:

"Mr. Charles H. Proctor's movement toward forming a national society of electroplaters is deserving of energetic support from all platers as well as those interested in electroplating. An organization of this kind will prove of untold advantage to platers as well as to the platers' employers. Certainly something should be done to awaken the plater to the fact that, from a scientific standpoint, he is way behind the times. By means of an organized society, where each plater can come forward and air his views on matters relating to his particular line of work, great aid will be given to the entire plating fraternity.

"I have one suggestion to make and that is that the society have a little wider field and include other branches of metal finishing. By other branches I refer chiefly to japanning and lacquering, as these two forms of metal finishing are in many factories under the supervision of the foreman of the plating departments. There is plenty of room for improvement in both of these fields and they would benefit by being included with electroplating."

The National Association

A discussion meeting was held on March 6 in the Hotel Chelsea, 222 W. 23rd Street, New York City, at which Mr. Proctor was elected chairman and Mr. Brown secretary. While the total attendance numbered eighteen, letters were received from over double this number of platers stating their interest in the proposed organization, and one Western plater showed his enthusiasm by sending $10.00 for the cause. The chairman, Charles H. Proctor, spoke of the value of an association of foreman platers and how he hoped that the association would grow to such an extent that a laboratory might be established in New York City for the purpose of research work. After the reading of letters from those who were unable to attend on account of their distance of residence, there was a general discussion of plans and scope of the society which finally resulted in the appointment of a committee by the chair including B. W. Gilchrist, L. J. Krom, Hugh Baxter, the chairman and the secretary to select a name and draft a constitution, and report within a few weeks. The following were present at the meeting: Charles H. Proctor, Otto Dennewitz, John J. Fannon, William McConnell, Frank Duffy, Hugh Baxter, Royal F. Clark, Herbert W. Cummings, H. H. Smith, B. W. Gilchrist, Nathan Emory, J. F. Meinke, L. J. Krom, Palmer H. Langdon, G. W. Cooper, T. A. Trumbour, E. B. Davidson, Percy S. Brown.

A second meeting was held on March 19 at the old Astor House in New York City and a third meeting on April 10 in Hotel Chelsea at which the new organization was completed.

The "National Association of Electroplaters of the United States and Canada" was the name adopted by the sixty charter members. Mr. Proctor was elected President; Nathan E. Emory, Foreman Plater, Victor Typewriter Company, New York City, Treasurer; and B. W. Gilchrist, Foreman Plater, Lalance and Grossjean Manufacturing Company, Woodhaven, N. Y., Secretary.

A constitution was approved which indicated that while the Association would have its headquarters in New York City and hold its monthly meetings there, it was really international in scope from its beginning. Not less than ten vice-presidents were provided for, one from each region:

(a) The New England States (except Connecticut)
(b) Connecticut
(c) New York
(d) New Jersey
(e) Pennsylvania, Delaware, Maryland, District of Columbia, Virginia, West Virginia
(f) Illinois, Michigan, Ohio, Indiana
(g) Missouri, Kansas, Colorado, New Mexico, Utah, Arizona, Nevada, California
(h) Wisconsin, Minnesota, Iowa, North Dakota, South Dakota, Idaho, Nebraska, Montana, Wyoming, Washington, Oregon
(i) North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas, Kentucky, Tennessee, Indian Territory
(j) Canada

At the next meeting on May 7, George B. Hogaboom was elected Librarian and Chairman of the Printing Committee.

Early Papers and Publication

The first papers presented before the new Society were given by Percy S. Brown and Royal F. Clark on June 25 and dealt with the use of arsenic in brass plating baths. The next meeting was devoted to a dis-

cussion of spotting out of plated articles with introductions by John J. Fannon, H. C. Barnard, and Mr. Mallard.

The Metal Industry was the official organ of the Association until the autumn of 1910 when the first "June-July-August" issue of the *Quarterly Review of the National Electro-Platers' Association of the United States and Canada* appeared. This highly prized issue was edited by August G. Hoffman of Jersey City, N. J., and contained short articles by Proctor, W. A. Jones, Clark, William Voss, C. De Baun, Charles A. Stiehle, J. S. Stremel and the editor, mostly on gold finishes. The Society has continued regular publication ever since.

The First Branch

The first branch of the Association was formed in Philadelphia on September 10, 1910 by F. C. Clement, Victor Talking Machine Company, Camden, N. J., who also became its first President. Several months were spent by the parent organization in drawing up the branch charter which was delivered at the Association's Second Annual Dinner on February 11, 1911.

The First Exposition

The Third Annual Meeting on February 10, 1912 was noteworthy in that it was combined with the first exposition held by the Association. The list of exhibitors shows many firms still active in the plating and finishing field: U. S. Electro-Galvanizing Company, Brooklyn, N. Y. (plating and galvanizing barrels); The Sangamo Electric Company, Springfield, Ill. (recording ampere-hour meter); The Electric Storage Battery Company, Philadelphia, Pa. (storage batteries for electroplating!); De Vilbiss Manufacturing Company, Toledo, Ohio ("air-brush" and compressors); Leiman Brothers, New York City (motor-driven sand-blast); The Metal Industry, New York City (copies of magazines and books on plating); The Eureka Pneumatic Spray Company, New York City (lacquer-finished products); The Roessler-Hasslacher Company, New York City, now a division of du Pont (new electroplating salts); The Munning-Loeb Company, Matawan, N. J., now part of Hanson-Van Winkle-Munning Company (booklets describing Optimus "dynamos"); The Rockhill-Victor Company, New York City (carboy rocker); The Abbott Ball Company, Hartford, Conn. (burnishing barrel and burnished parts); Rojas Electro-Chemical Company, New York City (parts finished by the Electro-Chroma process); Celluloid Zapon Company, New York City (samples of lacquer and enamel finished parts). There was also a platers' exhibit of a variety of finishes. The attendance was 182 out of a total membership of about two hundred.

The Present Society Formed

By the time of the next Annual Meeting in New York City on February 21, 1913, with an attendance of two hundred and eighty-one, the membership had grown to more than three hundred and fifty and ten branches had been formed: in Philadelphia, Chicago, Rochester, Toronto, Detroit, St. Louis, Cincinnati, Milwaukee and Dayton. Representatives from most of these branches and from New York City met to form a new organization better fitted to meet the needs of a group which had spread across the whole continent. As a result of their work, the American Electroplaters' Society was formed in New York City on June 1, 1913.

At this, the first Convention of the Society, George B. Hogaboom was elected President; Col. H. I. Hansjosten, Chicago, First Vice-President; W. S. Barrows, Toronto, Second Vice-President; F. C. Clement, Philadelphia, Secretary; John J. Schutz, Detroit, Treasurer; and S. R. Taylor, Newark, Editor. Branches in the following cities joined: New York City, Philadelphia, Newark, Rochester, Toronto, Detroit, Chicago, Indianapolis, Dayton, St. Louis, and Milwaukee. The A. E. S. was born.

The Industry and the Members

One of the first actions of the new Society was to appoint a joint committee with the Electrochemical Society to study the needs of the electroplating industry from a technical standpoint. This concern about the industry as a whole has always been a characteristic of the A. E. S. and, no doubt, is one of the prime reasons why it has continued to grow.

Another reason is the concern about the education of its members. Not only were papers on electroplating and allied arts read at Branch and Society meetings, but from the beginning the Branches set up schools for platers with laboratories where they could learn the fundamentals of their calling. The second issue of the *Quarterly Review* of the American Electroplaters' Society speaks of five such schools in operation with others being organized.

"Learn and pass along your knowledge" were the watchwords of those early days. They are still good.

A. E. S. Publications

"The Fundamentals of Electrochemistry and Electrodeposition" by Samuel Glasstone. Price $2.50.

Twenty authoritative chapters in simple language on the properties of solutions, Faraday's Laws, pH, electrode potentials, overvoltage, polarization, anode behavior, corrosion, etc. Successfully used for classroom instruction.

Proceedings of the American Electroplaters Society Vol. 33, 1946. Price now reduced to $5.50.

Twenty-one papers on copper, nickel, rhodium and tin plating; plating of strip and wire screen cloth; electrocleaning and electropolishing; magnesium treatment and parkerizing; polishing and buffing; organic coatings, etc. A. E. S. Research Annual Reports.

Proceedings of the American Electroplaters Society Vol. 34, 1947. Price now reduced to $6.50.

Fourteen papers and eight A. E. S. Research Annual Reports on barrel plating of nickel and chromium; brass, cobalt and nickel plating; zinc treatments; electroforming; buffing; physical properties of and stress in electrodeposits; plating room waste disposal; health hazards.

"Adhesion of Electrodeposits" by A. L. Ferguson. A. E. S. Research Reports Ser. Nos. 1, 2 & 8. Price 60c, 40c and $1.00 respectively.

No. 1: Detailed bibliography, general considerations, correlated abstract of published methods for measurement of adhesion. No. 2: Correlated abstract of unpublished methods. No. 8: Appraisal of available methods; determination of adhesion through the use of cement.

"Determination of Impurities in Electroplating Solutions" by Earl J. Serfass and W. S. Levine. A. E. S. Research Report Ser. No. 3. Price 50c.

First in a series. Colorimetric techniques and methods for determination of lead, iron, manganese and copper in nickel plating solutions.

"Stripping of Copper from Various Base Metals" by F. C. Mathers, C. E. Landwerlen and E. C. Martin. A. E. S. Research Report Ser. Nos. 4 & 7. Price 35c and 70c respectively.

No. 4: Literature review and bibliography of a variety of methods. No. 7: The calcium and sodium polycyanide-sodium cyanide methods; deplating in cyanide solutions.

"Porosity of Electrodeposited Metals" by N. Thon and E. T. Addison, Jr. A. E. S. Research Report Ser. No. 5. Price 80c.

Critical literature review and bibliography of chemical and physical methods with alphabetical index of test methods by metals.

"Disposal of Plating Room Wastes" by B. F. Dodge and D. C. Reams, Jr. A. E. S. Research Report Ser. No. 9. Price 75c.

Bibliography, including more pertinent references to general pollution control and abatement, disposal of pickling liquors, and allied subjects.

"Specifications and Tests for Electrodeposited Metallic Coatings" sponsored by American Society for Testing Materials and American Electroplaters' Society. Price $1.25.

Specifications for zinc, cadmium, lead, and copper-nickel-chromium coatings on steel, copper-nickel-chromium coatings on brass and zinc base die castings, and chromate finishes on steel; methods for tests; and recommended practi al for hard chromium plating and for preparing low-carbon steel for plating.

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Determination of Impurities in Electroplating Solutions

X. TRACES OF ALUMINUM IN NICKEL PLATING BATHS

a. e. s. research project no. 2

project director:
EARL J. SERFASS

associate:
W. S. LEVINE

location:
LEHIGH UNIVERSITY, BETHLEHEM, PA.

in collaboration with:
G. Frederick Smith
Frederick Duke

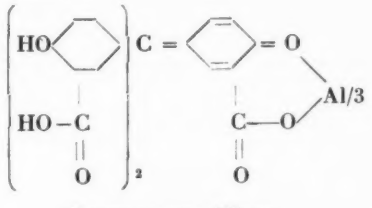
Acknowledgment is due the Research Committee, Dr. R. M. Wick, Bethlehem Steel Company, Chairman; the Research Directing Committee, Dr. Louis Weisberg, Consulting Chemist, New York City, and Dr. C. Fred Gurnham, Consulting Engineer, Hamden, Conn., Chairman and Vice-Chairman, respectively; and the Project Sub-Committee, Dr. D. Gardner Foulke, Hanson-Xan Winkle-Munning Company, Chairman, Dr. Walter R. Meyer, Enthone, Inc., and Dr. Henry B. Linford, Columbia University, for their contributions to this project.

This investigation was conducted for the purpose of obtaining a rapid and accurate method for the determination of traces of aluminum as an impurity in nickel plating baths. Other ions present in the nickel plating solutions as impurities were cadmium, copper, lead, manganese, iron, zinc, calcium, silicate and chromate ions. The method thus had to be applicable to solutions containing large concentrations of nickel as well as appreciable quantities of other interfering elements.

Various methods for the quantitative determination of aluminum may be found in the literature. These range from gravimetric through colorimetric to spectrographic methods. Since very small quantities of aluminum could not be determined by such methods as that of Willard and Tang[14], who used precipitation with urea, or the method of Cunningham[3], who determined aluminum in ferrochrome and chromium metal by precipitation of $Al(OH)_3$, these methods were not studied further. Spectrographic methods, such as that of Tourtellotte [13], who studied biological materials, were not pursued since the high cost of equipment made the methods impractical for the purpose desired. Since colorimetric methods had been successfully employed in determining aluminum in water, biological materials, etc., it was decided to attempt to adapt some such known method to the present needs.

The colorimetric determination of aluminum is based upon the formation of strongly colored lakes with a suitable organic reagent. The exact nature of the lakes is not definitely known, but may be regarded as colloidal aluminum hydroxide upon which the organic reagent, or dye, is adsorbed, producing a strong color. The intensity of the color is dependent on the concentration of aluminum. Some of the reagents in common use for colorimetric purposes are ammonium aurintricarboxylate, sodium alizarin sulfonate, eriochromcyanin and hematoxin[5,6]. Of these, ammonium aurintricarboxylate (hereafter referred to as "aluminon") is in wide use in the United States[4,7,8,10,12,15,16]. Since aluminon is available in a pure form and appears to give as satisfactory results as the other colorimetric reagents, it was decided to try to apply it to nickel plating baths.

Although aluminon may be used in a basic medium[12], the method has been found to give reproducible results on the acid side and with greater simplicity of operation[11]. Therefore, it was elected to use the direct method, by which the red color developed in acid medium is measured or compared. The red color formed has been ascribed by Fiegl to an inernal complex salt with the following structural formula:



Development Work

Since nickel, iron, and other metallic ions present in nickel plating baths interfere with the aluminon method (as well as with all other colorimetric methods), the first step was to develop a procedure for their removal. If the large amount of nickel were to be precipitated and filtered off, the result would likely be a

large loss of aluminum through adsorption and entrapment. Electrolysis with a mercury cathode in dilute sulfuric acid solution has been used to eliminate all interfering metals at one stroke[11], but the procedure is quite lengthy. Hence, it was decided to attempt to precipitate the nickel with some organic reagent and remove the precipitate from the aqueous solution by extracting it with an organic solvent. Sodium diethyl dithiocarbamate was found to be suitable for precipitating the nickel in a form which could be extracted with chloroform. About 90 mg nickel can be removed with about 35 ml chloroform by this method.

Tests were also made with dimethylglyoxime to precipitate the nickel. However, after chloroform, carbon tetrachloride, n- and iso-amyl alcohol, n-butyl alcohol, benzene, and ether had been tried as solvents, all unsuccessfully, this reagent was abandoned. Similar attempts were made with diethanol dithiocarbamate and the same solvents; these tests were also unsuccessful.

Iron, which interferes badly with the aluminon method, was removed with a 1 per cent solution of cupferron, widely used to eliminate small amounts of iron from aqueous solutions[1,2,8]. Amyl acetate readily dissolves the iron cupferride, and one or two extractions were found sufficient to remove all the iron from a 1 ml sample of an "impure" 50:50 nickel plating bath containing 1 mg iron. One ml of the 1 per cent cupferron was used.

After all the nickel and any iron had been removed from the sample, the determination of the aluminum was quite simple. A procedure was worked out closely following that given by Sandell[11] but with a few modifications which are described in the "Recommended Routine Procedure".

Extraction of the nickel by this method requires that the *p*H of the nickel bath be adjusted to about 2.0 and kept at this value. If it is much higher, some aluminum may be come extracted with the nickel. If it is too low, appreciable quantities of the diethyl dithiocarbamate will be decomposed. It was found that 1 ml of 1:1 hydrochloric acid added to 1 ml of the bath was sufficient to keep the *p*H at about 2.0 while the nickel was being extracted. In tests on the synthetic "impure" bath described below, 5 ml of the diethyl dithiocarbamate solution was added after the first extraction of nickel to make certain that any remaining nickel would be complexed. This necessitated a further addition of hydrochloric acid to bring the *p*H down to about 2.0. Thus, by addition of 1:1 hydrochloric acid in two separate portions, the dual purpose of removing the interfering ions and keeping all the aluminum in aqueous solution is accomplished. Adding all the acid at once would prevent complete removal of the nickel by destroying much of the carbamate reagent before it could combine with the metallic ions. This, in fact, was tried with unsatisfactory results.

TABLE I. CALIBRATION CURVE DATA

Aluminum Added microgram	Colorimeter Reading	Blank	Corrected Reading	Corrected Average Reading
10	109	67	42	
10	117	77	40	40
10	116	77	39	
20	154	85	69	
20	151	85	66	66
20	144	80	64	
40	185	80	105	
40	178	67	111	108
40	174	67	107	
50	186	65	121	
50	184	67	117	123
50	198	67	131	
50	206	85	121	
60	219	80	139	
60	216	67	149	144
60	215	67	148	
60	208	67	141	
70	236	77	159	
70	241	80	161	160
70	241	80	161	

TABLE II. IONS ADDED TO NICKEL BATH

Ion	Amount g/l	Ion Added as
Cadmium	0.2	$CdCl_2.2\frac{1}{2}\ H_2O$
Chromium	0.2	CrO_3
Copper	1.0	$CuCl_2.2H_2O$
Lead	0.05	$Pb(C_2H_3O_2)_2.3H_2O$
Manganese	1.0	$MnCl_2.4H_2O$
Iron	1.0	$FeCl_3.6H_2O$
Silicon	1.0	Na_2SiO_3
Zinc	1.0	$ZnSO_4.7H_2O$
Calcium	(Saturated)	$CaBr_2$

Preparation of Calibration Curve

After satisfactory results in extracting the nickel and other interfering ions using cupferron and diethyl dithiocarbamate had been obtained, a calibration curve was prepared using a pure synthetic 50:50 bath. This consisted of a 3-*N* nickel solution composed of 1.5-*N* nickel sulfate plus 1.5-*N* nickel chloride, with 30 g/l boric acid.

To 1-ml portions of the 50:50 bath were added varying quantities of standard aluminum solution. The "Recommended Routine Procedure" described in the latter portion of this paper was then followed except for steps 3, 4 and 7. The data obtained are recorded in Table I. By plotting the average values noted for each quantity of aluminum taken, the curve in Fig. 1 was obtained. A Klett-Sommerson photoelectric colorimeter with the green filter No. 54 was used in making all determinations. This filter transmits the greatest amount of light at 525 millimicrons, which is in the range in which the aluminum-ammonium aurintricarboxylate (aluminon) colored system shows the highest absorption. Fig. 2 shows the transmittancy curves for both the No. 54 filter and the colored system.

obtained with a Beckman ultraviolet spectrophotometer.

Accuracy and Precision

The method was finally checked for accuracy and precision by running several determinations on a 50:50 nickel bath to which various ions had been added as "impurities". Table II lists the amount of each. The metallic ions were added wherever possible as solid chlorides, sulfates, or nitrates, and the solution filtered to remove any undissolved matter.

All results are shown in Table III, from which it may be seen that the average error for all tests was about 5 per cent, with the greatest error at about 9 per cent. The precision is probably satisfactory for routine control work.

To further check the method for accuracy, samples of a 50:50 nickel bath containing, very approximately, 50 micrograms of aluminum were sent to several commercial laboratories for analysis. Copies of the method were included and the following organizations kindly cooperated in the test: Bethlehem Steel Company and The International Nickel Company. The results obtained in these laboratories and at Lehigh University are shown in Table IV.

Recommended Routine Procedure

The procedure adopted for the colorimetric determination of aluminum in nickel plating baths is as follows:

Reagents Required

1. Aluminon solution—0.5 per cent
   Dissolve 0.5 g aluminon (ammonium aurintricarboxylate) in 100 ml distilled water. Make up fresh solution every two to three days.
2. Cupferron solution—1 per cent
   Dissolve 0.25 g cupferron in 25 ml distilled water. Keep the solution cool, and make up fresh solution every day.
3. Chloroform—reagent grade, free of aluminum
4. Amyl acetate—c. p. grade
5. Hydrochloric acid—1:1
   Dilute c. p. grade concentrated hydrochloric acid with an equal volume of distilled water.
6. Hydrochloric acid—1:9
   Dilute 10 ml of c. p. grade concentrated hydrochloric acid with 90 ml distilled water.
7. Ammonium hydroxide—1:9
   Add 10 ml c. p. grade concentrated ammonium hydroxide to 90 ml distilled water.
8. Diethyl dithiocarbamate (sodium salt)—10 per cent
   Dissolve 100 g of the salt in 800 ml aluminum-free distilled water and dilute to 1 l. Filter off any undissolved matter.
9. Ammonium acetate buffer solution—10 per cent
   Dissolve 100 g c. p. grade ammonium acetate in distilled water to make 1 l of solution.
10. Standard aluminum solution—10 micrograms/ml
    Dissolve 0.1 g pure metallic aluminum in 20 ml concentrated c. p. hydrochloric acid and dilute to 1 l. Dilute 10 ml of this stock solution to 100 ml.

Apparatus Required

1. Volumetric flasks—100-ml volume
2. Separatory funnels—Squibb type, short-stemmed, of 100-125-ml capacity
3. Pipettes and burettes
4. *p*H meter or its equivalent
5. Any suitable colorimeter or spectrophotometer—A Klett-Sommerson colorimeter with a green No. 54 filter was used with a test-tube cell.

Procedure

A. Separation of interfering metals

1. Pipette a 1 ml sample of the nickel plating bath into a separatory funnel.
2. Add 1 ml 1:1 hydrochloric acid and 25 ml distilled water.
3. Add 1 ml 1 per cent cupferron, and shake for one minute.

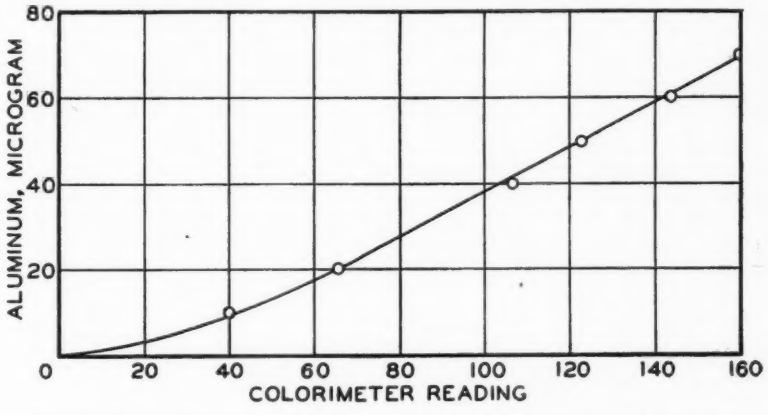


Fig. 1. Calibration curve for determination of aluminum in nickel plating baths (50:50 bath used) by the aluminon method. Instrument used: Klett-Sommerson colorimeter with green filter No. 54. Cell: test tube with about 12 mm I. D. Final volume of solution: 100 ml

TABLE III. ACCURACY AND PRECISION DATA

Aluminum Added microgram	Colorimeter Reading	Blank	Corrected Reading	Aluminum Found microgram	Error %
20	141	72	69	21	+5
40	168	67	101	38	−5
50	193	67	126	51	+2
50	199	67	132	54	+8
50	193	67	126	51	+2
50	198	67	131	53	+6
50	195	67	128	52	+4
60	203	67	136	56	−7
70	217	67	150	64	−9

TABLE IV. RESULTS OBTAINED BY DIFFERENT LABORATORIES

Laboratory	A	B	C
Aluminum, mg/l	40	40	42

4. Add 10 ml amyl acetate, shake for one minute, let the aqueous layer settle, and run it into a clean separatory funnel. Repeat by treating the aqueous layer with 5 ml amyl acetate. Discard the amyl acetate extracts.
5. Run 10 ml of 10 per cent carbamate solution into the aqueous solution and shake for 2 minutes, being careful to release the pressure built up by the gas formed in the reaction.
6. Add 25 ml chloroform, and shake for 2 minutes. Draw off the chloroform (bottom) layer and discard it as soon as settling is complete.
7. Add 5 ml more of 10 per cent carbamate, and shake for one minute; then add 1 ml 1:1 hydrochloric acid and shake again for one minute.
8. Extract with 5 ml portions of chloroform until the chloroform comes through completely colorless. This usually requires 3 to 4 extractions. Discard the choloroform extracts.
9. Run the clear aqueous solution through a qualitative filter, catching the filtrate in a 150 ml beaker. Wash the paper about five times with distilled water, letting the wash water combine with the filtrate.

B. Development of the colored system

10. Make the aqueous solution neutral with 1:9 ammonium hydroxide using a *p*H meter or other means. The volume should now be nearly 75 ml.
11. Add 1 ml 1:9 hydrochloric acid, and stir the solution to assure uniform mixing. Make up the volume to 75 ml.
12. Pipette 1 ml 0.5 per cent aluminon solution into the beaker and mix.
13. Add 10 ml 10 per cent ammonium acetate buffer, dilute to 100 ml in a volumetric flask, and mix well. Record the time.

C. Measurement of solution transmittancy

14. Partially fill the test tube cell with water as the reference liquid, and adjust the galvanometer needle to zero when the dial reading is zero. If the instrument used has a wave length selector, set it at about 540 millimicrons.
15. Let one-half hour elapse before taking a colorimetric reading.
16. Rinse out the test tube a few times with small portions of the red aluminum lake, replace the test tube in the instrument, and rotate the dial until the galvanometer needle is once again at its zero position. Record the reading on the scale attached to the dial.
17. Run a blank in a similar manner except that a sample of the bath is omitted.
18. Subtract the blank reading from the sample reading to get a corrected measure of the amount of light transmitted by the sample. This method of correction can be used only when the scale reading gives the extinction of the sample directly or is related to the extinction.
19. Look up the corrected scale reading for the sample on the calibration curve; the quantity of aluminum corresponding to this reading is the amount present in 1 ml of the bath.

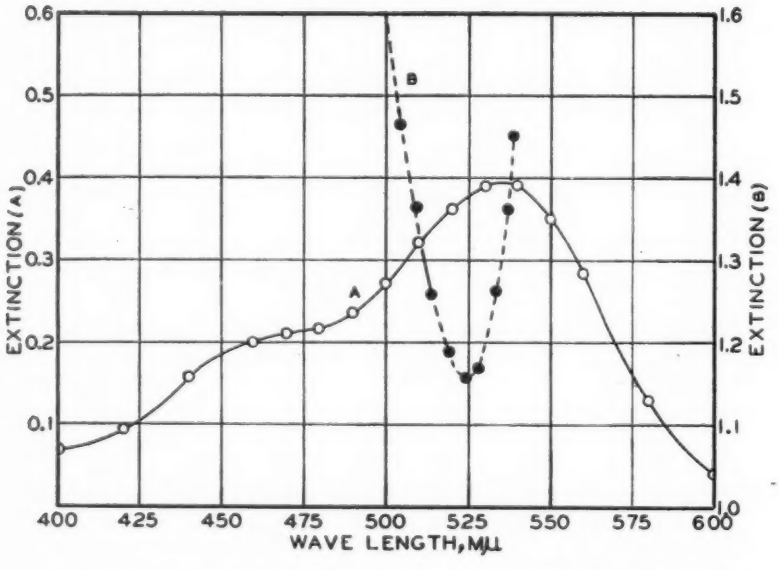


Fig. 2. Extinction vs. wave length for (A) the red lake with aluminon of 80 micrograms aluminum in 100 ml final solution (cell thickness 1.00 cm), (B) Klett-Sommerson green filter No. 54 (extinction units on the right)

Calculations

If the reading obtained with the unknown is 172 and that with the blank is 67, the corrected reading for the unknown is 172 − 67 = 105. According to the calibration curve, this reading corresponds to 40 micrograms of aluminum. Since a 1 ml sample was taken for analysis, the bath contains 40 micrograms of aluminum per milliliter or 40 ppm.

Stop-and-Go Method

If a colorimeter is not available, the amount of aluminum present in nickel plating baths may be estimated within 20 ppm as follows:

1. Follow "Routine Procedures" through step 13.
2. Prepare a series of standards containing 0, 20, 40, 60, 80 micrograms of aluminum per ml of pure nickel bath by using the same procedure as in the preparation of the calibration curve.
3. Having added the aluminon solution and the ammonium acetate buffer to all the standards as well as to the unknown at about the same time, compare the unknown to the series of standards after ½ hour by viewing the solutions in Nessler tubes horizontally against a white background. The amount of aluminum in the unknown is approximately equal to the amount of aluminum in the standard solution whose color it most nearly matches.

Discussion

In the application of the method described above there are several factors that must be carefully controlled:

1. The *p*H of the solution must be low enough to prevent loss of aluminum when the nickel is precipitated with the diethyl dithiocarbamate. When the *p*H is about 3.5, results are erratic, and when the *p*H is less than 2.0, some sulfur and carbon disulfide are formed as a result of the decomposition of the reagent. At a *p*H of around 2.0, there is no apparent loss of aluminum and little decomposition of the reagent.

2. The purpose of the filtration is to remove material that will cause the red aluminum lake to be cloudy in appearance if it is not removed. Tests showed no appreciable loss of aluminum on filtration of the aqueous solution remaining after the chloroform extractions.

3. Because the solutions may possibly have different acidities after the chloroform extractions, it is necessary to adjust the *p*H to about 7.0 and then add the recommended amount of hydrochloric acid. By these means all solutions will have the same *p*H when the aluminon reagent and the buffer are added. The

(Continued on page 1054)

Letters to the Editor

Subject: Shortages

DEAR SIR:

In your article in the June issue entitled "Conservation of Chromic Acid" and in your July editorial on "Nickel Shortage" you make a number of recommendations as to how the plater should meet the present situation. I am with you as far as elimination of waste is concerned; waste is sinful and like President Coolidge I am "agin" sin. However, the greatest source of waste is rust, and when you in your editorial say, "reduce the nickel thickness as much as necessary", then I object.

We have for a long time been admonished to increase the nickel thickness on ferrous products to improve the corrosion protection, which certainly is in the interest of the plating industry. To turn about now and reduce the nickel thickness invites real waste through rusting and would hurt both the industry and ourselves as platers. I am sure that the increased tonnage of nickel used for plating during 1947 and the beginning of this year has not gone into heavier and better deposits but to take care of the increased production of plated parts. A decrease now would be fatal.

There are millions of small steel parts that are barrel plated to 0.0001 inch of nickel or less. To use still thinner deposit would be a joke, and a bad one at that.

The suggested use of clear organic coatings over the nickel-chromium plate is not in the interest of the better plating for which we as working members of the A. E. S. should always be striving.

Since the methods for conserving nickel (except waste elimination) previously attempted are inadequate, as pointed out in the editorial, the only answer to the problem is increased production of nickel, as well as of chromic acid. I know the many reasons that are advanced why this is not economically feasible. Still, if the producers want to preserve the plating industry which is an important outlet for their products, they must meet the present challenge realistically.

The plater should see to it that the producer or supplier is furnished the true facts about his requirements. This demands first that the thickness of coating be specified, second that steps be taken to assure that the specified thickness be applied, and third that the area of parts plated with any given thickness, i. e., weight, of coating during any given time period be known. From this the metal requirement can be calculated with reasonable accuracy.

In our company, the H. M. Quackenbush, Inc., of Herkimer, N. Y., we have standardized on a minimum nickel thickness of 0.0002 inch or an average thickness of 0.0003 inch which experience has proved entirely satisfactory on the parts we manufacture, none of which sees outdoor service. For each part that is nickel barrel plated we have determined the number of parts which make up a cylinder load, the square feet area per load, the weight of nickel required to deposit an average thickness of 0.0003 inch on the load, and the weight of the load. Some typical data of this nature is summarized in Table I. From them can be calculated the nickel requirements for any production schedule.

The time of plating to a given average thickness naturally depends on the amount of current drawn by the particular load in the cylinder. We therefore have plotted straight line graphs like the one in Fig. 1 which shows this relationship for the standard load of each part. These graphs together with the aforementioned data have been framed and hung on the panel board in plain sight of the barrel operators who use them to adjust the plating time.

It has been argued that this is an impractical procedure in a plant in which thousands of different parts are being plated. However, I see no valid reason why the area of each part cannot be included among the engineering data on the blueprint, which in many plants accompanies each part from start to finish. The

TABLE I. NICKEL REQUIREMENTS FOR SELECTED PARTS

Average nickel thickness 0.0003 inch

Part	No. per Load	Lb. per Load	Area per Load, sq. ft.	Weight of Nickel per load, oz
Handle	1,600	210	67	14.6
Nut pick	3,100	86	54.5	11.9
Link	40,100	182	259	56.5
Pin	105,100	168	157	34.2

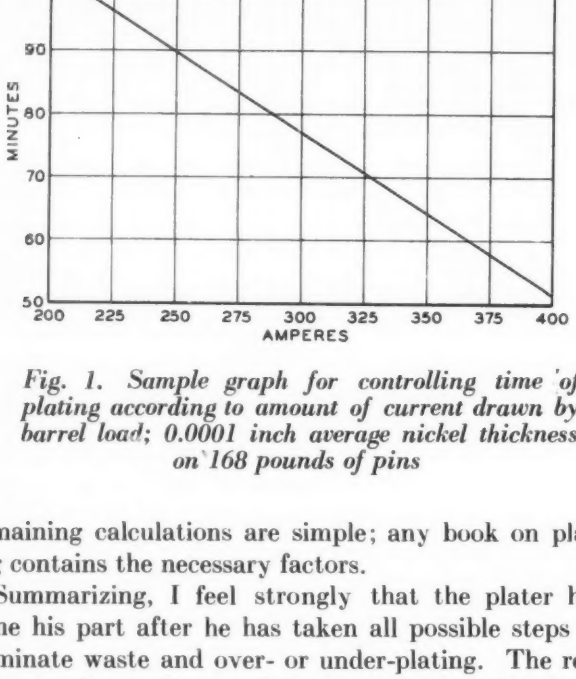


Fig. 1. Sample graph for controlling time of plating according to amount of current drawn by barrel load; 0.0001 inch average nickel thickness on 168 pounds of pins

remaining calculations are simple; any book on plating contains the necessary factors.

Summarizing, I feel strongly that the plater has done his part after he has taken all possible steps to eliminate waste and over- or under-plating. The rest is up to the producers of plating materials who have promoted their use. —

GEORGE SIMMONS,
President, Syracuse Branch, A. E. S.

As far as the nickel supply situation is concerned, I am informed that although the plating industry is receiving much more nickel now than in 1947, the supply situation has improved considerably since the publication of my original editorial. The outlook for chromic acid is also brightening. The Fiber Chemical Corporation, Clifford, N. J., has just reported that its recently completed plant for the manufacture of flake chromic acid analyzing 99.75 to 99.90 per cent CrO_3 is now in full production and that plans are already under way for an extension of capacity as a result of the continued heavy demand. The following communication from Mutual Chemical Company of America indicates that this leading supplier has taken steps to increase his production of chromic acid and believes that the most critical period has passed.—

EDITOR.

Subject: Chromic Acid

DEAR SIRS:

The following comments may throw some light on the present shortage of chromic acid.

The keystone of all chromium chemicals is bichromate of soda, which, besides being widely used as such, is the material from which the others are made. In addition to chromic acid production, bichromate of soda is essential in leather tanning, color making, textile processing, and a number of other basic processes and products.

To make one pound of chromic acid requires over one and a half pound of bichromate.

In the last ten years the U. S. production of both bichromate and chromic acid has about doubled. The increase in chromic acid has kept pace with the increase in bichromate.

Despite these substantial increases, the demand for bichromate continues in excess of present plant capacity and the demand for chromic acid in excess of the bicromate which can be allotted to its manufacture. A larger allotment seems possible only if more bichromate is produced or the need for other purposes slackens.

Regarding the prospects for an immediate increase in bichromate production, we are confident that steps now being taken toward the elimination of certain bottlenecks and the more efficient utilization of our working forces will increase our output. Beyond this and with a view to the longer range needs, we have started construction of a new bichromate plant which should be completed early in 1950 and then provide adequate additional material for all purposes. Chromic acid will, of course, be increased as more bichromate becomes available.

Since the outbreak of the war we have followed certain principles in the allocation, sale and pricing of our materials and to these we still adhere. Among these were the insistence that domestic demands should have precedence over foreign; that the needs of our regular customers, at least to the extent of quantities they received in prior years and more if possible, would have the highest priority; and that we would actively resist and discourage all speculative and inflationary influences.

Material has been allotted to consumers and dealers accordingly, priced consistently with costs, and sold on established price schedules. Our dealers have been urged to sub-allocate to their regular customers, sell, and price on the same basis.

No complaints have been received from direct consumer customers alleging unfair treatment. That some of our materials has been sold in the black market and that some dealers' customers did not receive allotments based on quantities of prior years is regrettable and indicates that the policies we wished to pursue, but could not enforce, have not always been followed by resellers. Such departures, we believe, have been limited in number and quantity.

We believe that the most critical period of shortage has passed and that the margin between supply and demand will gradually decrease in the ensuing months and is likely to disappear by the end of next year.—

MUTUAL CHEMICAL COMPANY OF AMERICA.

Book Review

by DR. HAROLD J. READ,
Associate Professor of Metallurgy
The Pennsylvania State College

CORROSION HANDBOOK edited by Herbert H. Uhlig, 1948, xxxiii + 1188 pages. Sponsored by The Electrochemical Society, Inc., and published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. Price, $12.00.

This book, which has been edited with great care and evident skill by Dr. Uhlig, is without doubt the most useful compilation of practical information on corrosion ever printed in the English language. In this respect it is, indeed, a handbook, but in addition there is a considerable body of theoretical discussion which may at first glance appear to have no rightful place in a handbook. It must be remembered, however, that the corrosion engineer seldom meets with a problem which is exactly like those in which experience has been compiled by a multitude of other engineers or which can be treated mathematically, and it is rarely that his problems are as well defined as those of, for instance, the heating engineer who can flip the pages of his handbook to find definite pipe sizes, radiation area and other data exactly applicable to the problem at hand.

What the corrosion engineer needs is fundamental information on the type of problem with which he is confronted plus such relevant data as may be available. Much of this body of data takes the form of actual corrosion rates of a great variety of materials under well-defined exposure conditions. Such information is always hard to locate in the extremely voluminous journal literature of corrosion, and its critical compilation in a single volume is of great value.

Some 103 eminently qualified contributors provided the material which Dr. Uhlig has assembled into a well-organized volume with the advice and assistance of an editorial board of nine outstanding corrosion experts. The work was sponsored by the Corrosion Division of the Electrochemical Society and is a splendid example of what may be accomplished by cooperative effort, particularly when an energetic and qualified individual such as Dr. Uhlig devotes a great deal of time and effort to leading the project.

The book is divided into several sections of which the first includes four brief articles on general corrosion theory. Specific and specialized items of theory are found at appropriate places throughout the book.

The second section is an extensive treatment of the behavior of metals and their alloys as well as many non-metals in specific corrosive environments. The metals (but not the non-metals) are arranged in alphabetical order and include all of those of any industrial importance.

For the most part the third section deals with the nature and effects of environments such as sea water, soils, lubricants, and high temperature steam, although several special topics, e. g., galvanic couples, are included. There are fewer practical data here than in the preceding section, but the problems are well stated and remedial measures are given.

Sections four and five are concerned with corrosion at high temperature and resistant materials. In the former the text is subdivided on the basis of the metallic elements, their alloys, and a few non-metals. Extensive tables of the corrosive properties of chemical resistant materials are given in section six. They are classified according to several acid and alkali groups.

The value and proper application of various methods of corrosion protection are presented in section seven. The various types of metallic, inorganic, and organic coatings are discussed in conjunction with tables of corrosion rates, and there is also material on inhibitors, passivators, and cathodic protection.

An extensive section on corrosion testing concludes the volume, except for a few miscellaneous items. Laboratory tests, field and service tests, the preparation and cleaning of specimens, and the application of statistical methods to the evaluation of test results are all presented both descriptively and critically.

A good index, which is so essential in a volume of this kind, has been provided. Articles of a general nature have been distinguished by printing the page references in bold face type.

A BIBLIOGRAPHY ON DIE CASTING, 1910–1946, compiled by the Editors of Die Castings Magazine, 74 pages. The Technical Publishing Company, 1240 Ontario Street, Cleveland, Ohio.

This paper-bound volume consists entirely of a collection of literature references on the subject of die castings which are classified under the following headings: alloys, applications and uses, design, finishing, general, machines, process, properties, and books and pamphlets. Within these categories the individual references are arranged alphabetically according to the name of the senior author. The title of the article is given as part of the reference. The last eight pages of the book contain a classified index of articles which appeared in the first four volumes of the magazine *Die Castings*.

A compilation of this sort will undoubtedly be of assistance to those who have reason to consult the literature relative to die casting, and, while no positive opinion can be given with respect to its completeness, a few spot-checks did not reveal any errors or omissions.

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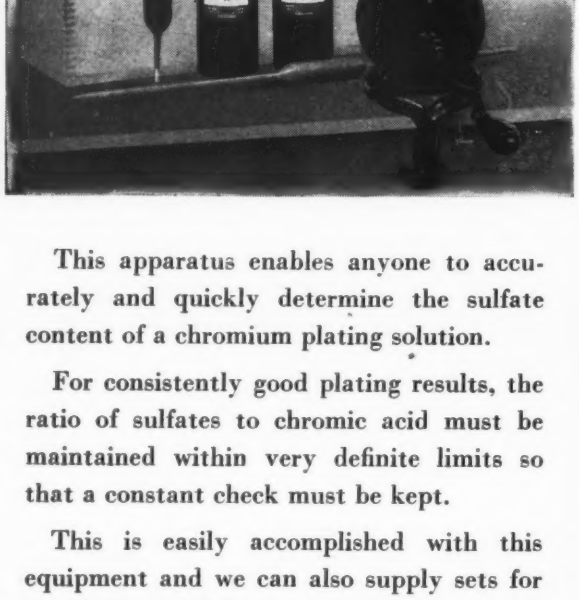

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Abstracts

For copies of original articles, turn to your Public Library for photostats or addresses of the publications in question

Electroplating on Non-Conductors; Some Practical Experiences. A. H. Stuart. Electroplating **1,** 187–191 (March, 1948).
In order to accomplish the above, it is necessary to provide a conducting film. The author describes his experiences which have led to a preference, in most applications, for colloidal graphite for this purpose. Discusses available metallic powders, silver-film production, use of graphite, the plating bath, application to porous surfaces, and causes of poor adhesion.

Methods and Technique of Automatic Polishing. H. C. Clements. J. Electrodepositors' Tech. Soc. **23,** 79–90 (1948).
Automatic polishing machines are classed as full automatic, semi-automatic, or special purpose. Uses and construction are discussed and illustrations are given. Polishing wheels and compounds are briefly mentioned —LYMAN B. SPERRY.

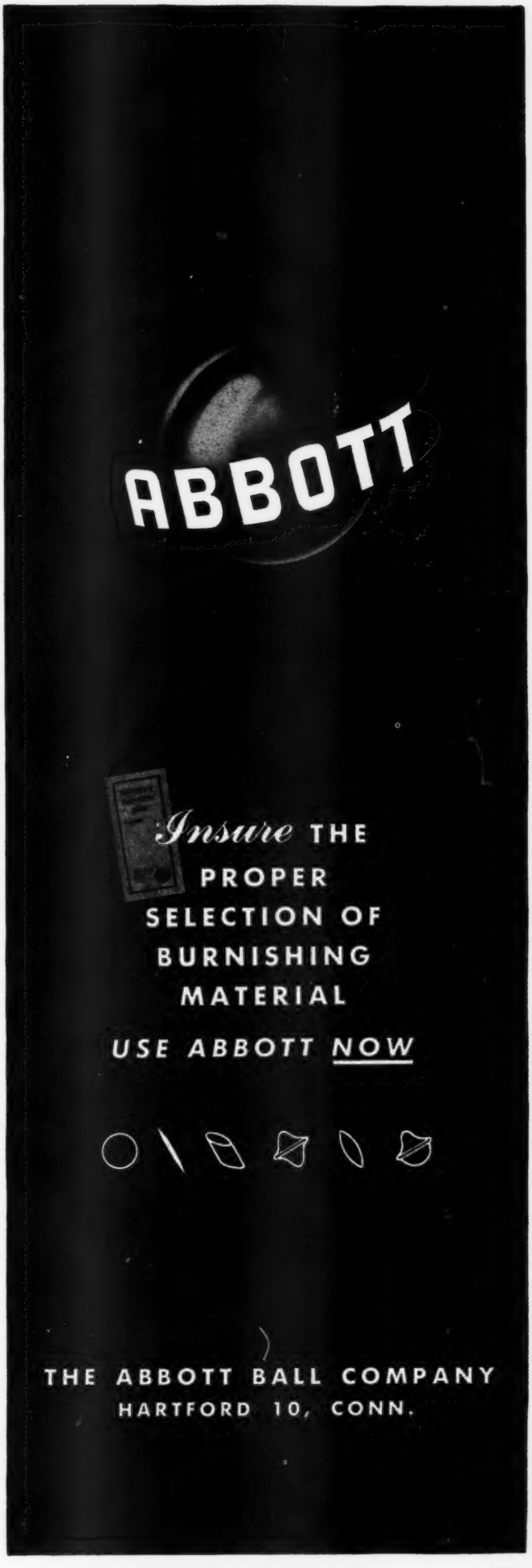
Patterning Stainless Steel. Anon. Electroplating **1,** 203–204 (March, 1948).
Describes methods for producing permanent designs in various shades of yellow, brown, and black by either chemical oxidation or anodizing.

The Metallization of Plastics. J. R. I. Hepburn. Cleaver-Hume Press, Ltd., London, 1947, 71 pp.
Describes and illustrates covering of plastic materials with a metallic deposit in order to modify their mechanical, optical, electrical, thermal, or chemical properties. Discusses availability, special characteristics and application of each, and testing of resultant deposits.

Metal Coatings by High Vacuum Evaporation. Philip Godley. Iron Age **161,** 90–94 (April 1, 1948).
Discusses briefly some of the fundamental aspects of evaporated coatings, and describes units for both continuous and batch-type work. Also comments on the physical characteristics of such coatings and lists some interesting applications including the coating of thin plastic sheeting and condenser paper.

Health Hazards of Metal Cleaning Compounds. Part IV. P. M. Van Arsdell. Organic Finishing **9,** 38–43 (March, 1948).
Reviews the above for several additional chlorinated solvents. 29 ref.

Plating on Aluminum. Electroplating **1,** 271–273 (1948); Metals Rev. **21,** 24 (May 1948).
In a process just patented in England by a Swiss con-



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cern, copper is first deposited on a cleaned and partially deoxidized aluminum surface. Hydrogen liberated during the coppering operation is believed to reduce all remaining oxide.

The Lead Plating of Bronze Bearing Surfaces for High Pressure Fuel Pumps. H. Silman and M. F. E. Fry. J. Electrodepositors' Tech. Soc. **23,** 43–52 (1948).

Plating lead on aluminum bronze was necessary in order to obtain satisfactory bearing surfaces in turbojet engines. Infusion of the lead with tin, for this particular application, was found superior to infusion with indium. The plating process is described in detail, and includes first flashing in a stannate bath, removing this first flash in an etching solution, and tin flashing again; for some reason not as yet fully understood, this procedure eliminates a certain percentage of blistered plate obtained when using only a single flash. Lead plating in a fluoborate bath follows.

Critical details of different operations are pointed out. Infusion is accomplished in an oil bath, and is followed by hand lapping on a glass plate. Each piece is subjected to a running test. A brilliant answer to a very difficult problem, and a very informative paper. A diagram and photographs are included.—LYMAN B. SPERRY.

Application and Use of Heat-Resisting Aluminum Coatings. Gottfried Kremer and Karl Erich Volk. Stahl u. Eisen **66-67,** 250–255 (1947); C. A. **42,** 2903 (1948).

The methods available for aluminum coating carbon steels are: spraying, aluminizing (Calorizing), dipping, electroplating, vapor coating, rolling, or pressing. If a subsequent diffusion treatment is to be performed, oxidation of the base metal has to be prevented by coating with water glass or by the use of controlled atmosphere. The processes are described in some detail. Brief abstracts of the discussion are included.

Accident Prevention Through Metallizing with Zinc and Aluminum. W. C. Reid. Safety Eng. **92,** 16–17, 50–51 (1946); Met. Abs. **15,** 466 (1948).

Coatings of almost any non-sparking metal can be applied to cat walks, steel floors and decks, powder bins, gas tanks, acetylene and hydrogen cylinders, and other surfaces which present a constant fire hazard because of their sparking tendencies. A thin coating of aluminum or zinc applied by metallizing to belting eliminate the static hazard.

Analytical Procedures for the Determination of Metals Affecting Sewage Treatment. M. L. Riehl. Sewage Works J. **20,** No. 4, 629–639 (1948).

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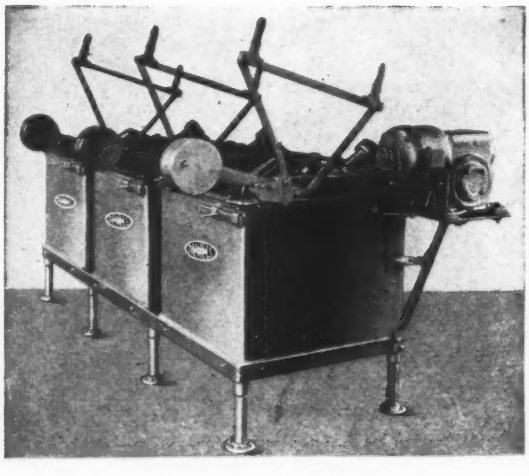

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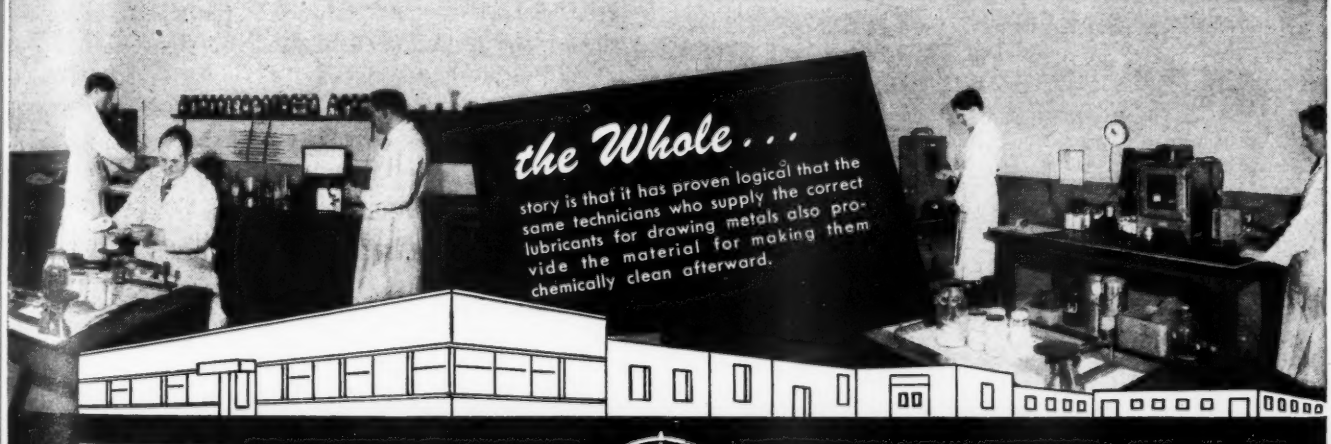
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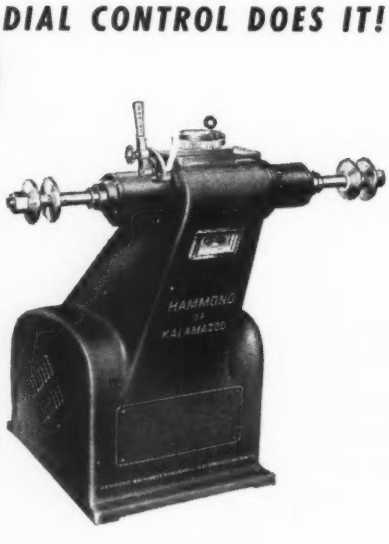

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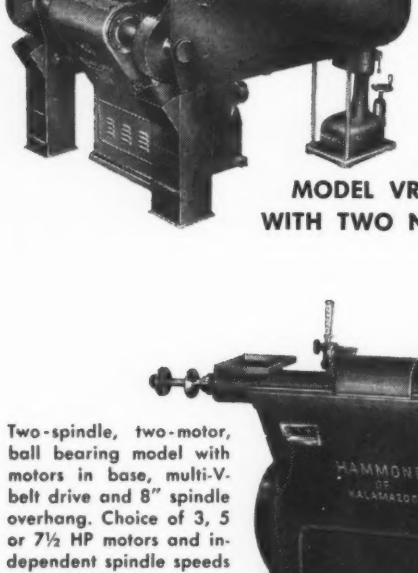

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Iron, copper, and zinc definitely have a deleterious effect on sewage treatment processes, and nickel and chromium are suspected. Other metals are possible offenders. Colorimetric methods of analysis of sewage for cyanide, iron, copper, zinc, chromium, and nickel are given. References are made to published methods of analysis of sewage for cadmium, tin, lead, and mercury. 11 ref.—LYMAN B. SPERRY.

Industrial Electrodeposition. Quality of Adhesion—Testing of Deposits. R. E. Wilson, Metal Ind. 72, No. 11, 211–213; No. 13, 251–253 (1948).

Roughening of the surface of the base metal is to be deprecated; a more adherent deposit is obtained on a finely finished surface than on a rough one. Tests have been made to ascertain the effect of the preliminary etching treatment on mild steel. The first specimen was plain steel; the second, one from which nickel plate had been removed; both gave identical results. Nickel plated specimens, however, while having the same yield load, yield stress, and ultimate stress had considerably lower extension and reduction of area at the point of fracture.

On heating chromium up to 600° C (1112° F) there is an immediate softening effect, followed by a temporary increase in hardness. Chromium is not suitable for use much above 600° C, at which stage it is rapidly converted to oxide when exposed to the air. For this reason it was not found feasible to continue the test beyond a period of about 24 hours at temperatures of 800° C (1472° F), as the chromium had practically disappeared. Nickel deposits are much more stable: up to 400° C (752° F) there is a very slight loss in hardness, and after about 10 days heating the nickel appears to become stable; at 800° C it still maintains its hardness at about half the original value. At high temperature the nickel appears to become diffused into the basis metal and the adhesion is actually improved, the yield and ultimate stress figures remaining substantially unaltered.

Nickel is an excellent material for resisting corrosion fatigue and is to be preferred to chromium for this purpose. Tests have been made to ascertain the effect of corrosion fatigue on plain mild steel bars and on mild steel bars which had been nickel plated. These specimens were tested in a rotating beam fatigue machine at a speed of about 2,200 stress cycles per minute with two equal upward and downward loads spaced 2 inches apart and applied near one end of the specimens. During the whole course of the test a fine spray of 3 per cent common salt solution was injected onto the test portion of the specimen. The results showed that in this case the plating had increased the endurance limit by some 67 per cent.

Nickel compares most favorably with chromium in its resistance to fretting corrosion in bearings. Of the many combinations of materials which formed the subject of investigation, comprising a hardness range from that of chromium to that of brass, the best

results were found, in the case of lubricated surfaces, with a pair of metals of which nickel was one. In general, hard materials appear to produce corrosion debris, chromium giving a very bad performance and stainless steel also being very unsatisfactory.

As regards mechanical wear, chromium shows a great superiority in that its coefficient of friction is very much lower than that of nickel. Care, however, has to be taken to see that the surfaces in contact are well lubricated because chromium has no capacity for absorbing oil, being non-wettable. Further, the bearing metal used should be one which can of itself absorb oil, such as white metal; in the case of contact between chromium and steel, it is necessary to ensure that the surfaces are constantly wetted. Best results have been had when the chromium surface is finished by honing or lapping; if thin deposits are to be applied, the surface of the basis metal should be highly finished by lapping or polishing so that the thin chromium layer can be polished to the same finish. Nickel deposits can be tooled or ground. Chromium deposits, on the other hand, can only be ground, which limits its application to surfaces which can be finished by this means. Should very heavy deposits of chromium be applied, grinding also becomes rather difficult because it tends to assume a very rough surface. Therefore, where there is a large amount of wear and a chromium surface is desired, it is customary to deposit nickel first, machine it, and then apply a light coating of chromium. This procedure also makes the best provision for resistance to corrosion.

Although chromium is very hard, it is not recommended for use where sharp edges are involved, as in the case of cutting tools. Its tendency is to blunt sharp edges owing to the globular deposition on such areas; when the globules are removed, the plate has not sufficient strength to withstand severe pressure at a right angle and will collapse. It is, therefore, not considered desirable that chromium should be applied to a right angle; all sharp edges should be removed by means of a radius or chamfer.—L. H. SEABRIGHT.

Plating Shop Layout. A. W. Wallbank. J. Electrodepositors' Tech. Soc. **23**, 33–41 (1948).

Elementary principles of plating shop layout are discussed and illustrated. English law specifies that the height of the tank edge above the floor on which the operator stands be not less than 3 feet.—LYMAN B. SPERRY.

An Analysis of the Polishing Problem. W. H. Sawyer. J. Electrodepositors' Tech. Soc. **23**, 59–78 (1948).

In the author's own words, this paper is "a 're-hash' of well-known generalizations" presented in such a manner as to stimulate investigation and reform. The polishing department is justly pictured as too often suffering because of mistakes or poor workmanship in other departments.—LYMAN B. SPERRY.

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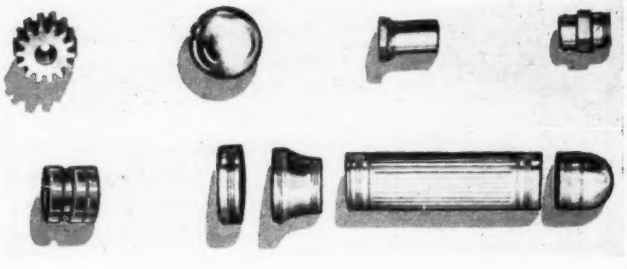

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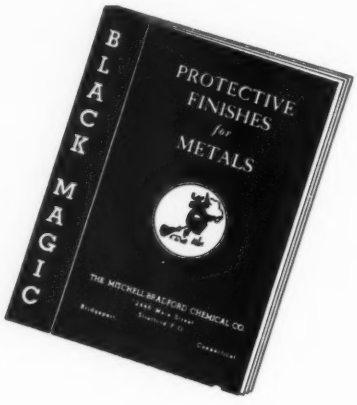

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- BLACK MAGIC for Copper and its Alloys

PROTECTIVE FILM FINISHES
- WITCH DIP, Wax Base Compound
- WITCH OIL, Water Displacing Corrosion Inhibiting Oil
- FINISH No. 146, Hard Protective Coating and Paint Bond

METAL CLEANERS
- BLACK MAGIC Alkali Cleaners for all metal cleaning purposes
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- QUICK TEMPER TEMPERING AND DRAWING SALTS—275° F. and 420° F. Melting Points
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Patents

By GEORGE B. HOGABOOM
Consultant, New Britain, Conn.

No. 2,445,675, July 20, 1948—Apparatus for Producing Coated Wires by Continuous Process—W. C. Lang.

CLAIM 5. Apparatus for coating wire by continuous electrolytic process comprising a plurality of electrically conducting pipe sections in end-to-end relation having their ends insulated from each other, each of said sections having a fluid entrance at bottom on one end and a fluid exit at top on the opposite end for circulation of fluid in said sections and for the elimination of gas pockets of any accumulated gas in the section, the sections having interposed electrically conducting drawing dies between some of said sections, an electric current supply means supplying current to the drawing dies and to the sections, and some of said sections having inner walls tapering uniformly toward an intermediate point to maintain uniform current density on the wire, and means for conveying the wire through the treating sections and dies, including means for reducing tension on the wire during its travel through said sections, comprising a power drive engaging the body of the wire at a point intermediate the ends of the treating section.

5 claims, 18 figures.

References cited: U. S. Patents 396,437; 742,443; 799,860; 816,280; 1,058,048; 1,069,151; 1,077,894; 1,103,382; 1,120,191; 1,169,819; 1,590,599; 1,709,523; 1,805,236; 1,862,138; 1,897,902; 1,970,804; 1,995,528; 2,075,331; 2,142,486. British Patent 11,547. German Patent 683,169.

No. 2,446,331, August 3, 1948—Electrodeposition of Aluminum—Frank H. Hurley, assignor to William Marsh Rice Institute, Texas.

The following specific operating example is set forth by way of further illustrating the invention and not by the way of limitation.

A plating mixture containing 63.0 mol per cent (1.58 weight units) of aluminum chloride (taken as $AlCl_3$) and 37.0 mol per cent (1 weight unit) of ethyl pyridinium chloride was prepared by adding the aluminum chloride to the molten pyridinium salt. The mixture was transferred to an aluminum pot which served as both container and anode. This was fitted with a suitably designed top to prevent absorption of moisture by the bath. The cathodes which could be inserted through the top consisted of suitably cleaned sheets of steel and other metals, 5 cm (2 inches) wide and 14 cm (5½ inches) long with a depth of immersion in the plating liquid of 3.5 cm (1⅜ inch). The temperature of the plating bath was maintained

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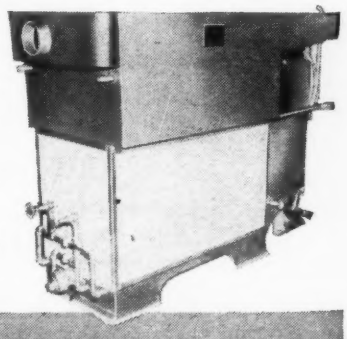

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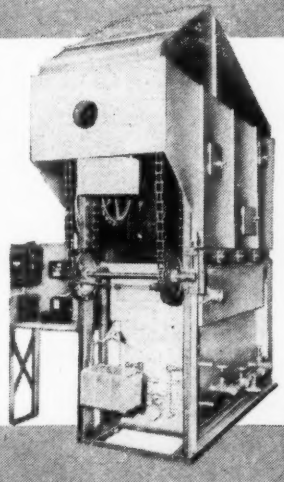

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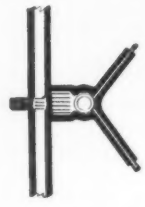
USE READER SERVICE CARD; INDICATE A 718.



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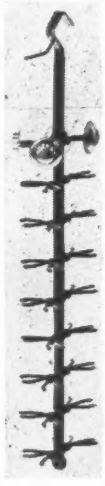

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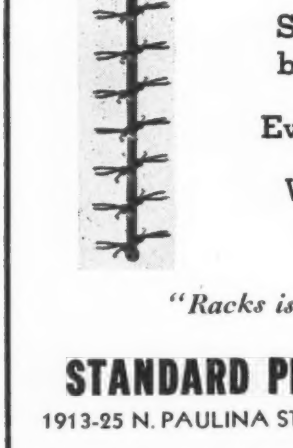

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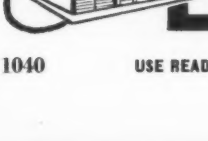

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at 125° C (257° F) by immersing the aluminum po in a large oil bath.

CLAIM 1. A process of electroplating that comprises electrodepositing aluminum as a bright, adherent deposit on a metal from the group consisting of iron, copper, brass, bronze, lead, nickel and tin from a cell containing a liquid non-aqueous electrolyte consisting essentially of a fused mixture of (1) about 2 mols (1.86 weight units) of aluminum chloride and (2) 1 mol (1 weight unit) of ethyl pyridinium chloride.

2 claims.

References cited: U. S. Patents 1,911,122; 1,939,397; 1,960,334; 2,170,375.

J. Phys. Chem. **35**, 2289 (1931); Chem. Abstr. 32, No. 18, 6956 (September 20, 1938); "Electrochemie Nichtwässriger Lösungen", by Paul Walden, pp. 194, 200, 239; J. Am. Chem. Soc. **19**, 563 (1897).

No. 2,446,349, August 3, 1948—Electrodeposition of Aluminum—Thomas P. Wier, Jr., assignor to William Marsh Rice Institute, Texas.

A mixture of ethyl pyridinium bromide and aluminum chloride in the ratio of 66.7 mol per cent (1.42 weight units) aluminum chloride (taken as $AlCl_3$) and 33.3 mol per cent (1 weight unit) ethyl pyridinium bromide was prepared and toluene was added until the mixture was saturated.

Cathode current densities between 0.5 and 1.0 amp/dm² (about 5 to 10 asf) were found most useful. At the lower cathode densities (about 0.5 amp/dm²) white plates of aluminum were obtained while at higher current densities (about 1 amp/dm²) the plates were very bright and shiny.

The cathode efficiencies are very high, being about 85 per cent at 0.5 amp/dm² and 92 per cent at 1.0 amp/dm². A nitrogen atmosphere or an atmosphere of a non-oxidizing gas should be maintained over the bath.

CLAIM 1. A process of electroplating that comprises electrodepositing aluminum as a bright, adherent deposit on a metal from the group consisting of iron, copper, brass, bronze, lead, nickel and tin from a cell consisting essentially of a mixture of (1) about 2 mols (1.42 weight units) of aluminum chloride and (2) about 1 mol (1 weight unit) of ethyl pyridinium chloride and (3) a sufficient amount of toluene to saturate the mixture.

2 claims.

References cited: Same as for No. 2,446,331, supra.

No. 2,446,350, August 3, 1948—Electrodeposition of Aluminum—Thomas P. Wier, assignor to William Marsh Rice Institute, Texas.

CLAIM. In a process of electroplating with aluminum the step of subjecting an article of metal from the group consisting of brass, copper and iron serving as a cathode, simultaneously to an alternating current and a direct current, passed between said cathode

USE READER SERVICE CARD; INDICATE A 720.

and an aluminum anode and through a fused, anhydrous bath consisting of about 2 mols (1.86 weight units) of aluminum chloride and 1 mol (1 weight unit) of ethyl pyridinium chloride, to plate aluminum onto said article; the root mean square value of the alternating current being about two to three times the value of the direct current.

1 claim.

References cited: Same as for Nos. 2,446,331 and 2,446,349, supra.

No. 2,446,716, August 10, 1948—Terne Electroplating Bath—John S. Nachtman.

CLAIM. A terne electroplating bath formed from the following components substantially in the ratios set out: white lead—112.5 g/l (15 oz/gal), stannous oxide—11.35 g/l (1.5 oz/gal), boric acid—186.8 g/l (24.9 oz/gal), hydrofluoric acid (30 per cent)—650 g/l (86.7 oz/gal), nicotine—10 g/l (1.3 oz/gal), beta-naphthol—2 g/l (0.27 oz/gal).

1 claim.

References cited: U. S. Patent 1,544,726.
Trans. Electrochem. Soc. **26,** 117–128 (1914).

No. 2,446,983, August 10, 1948—Zinc Electroplating Process and Electrolyte—Alvin F. Prust, assignor to Republic Steel Corporation.

CLAIM 6. The method of forming a bright, dense, fine, adherent coating of zinc on ferrous metal which comprises the steps passing an elongated ferrous metal article through a pickling bath and then through an aqueous electrolyte having a *p*H value of from 4.8 to 5.4 and containing, per gallon thereof, from 10 ounces to 20 ounces of zinc chloride, from 10 ounces to 20 ounces of sodium chloride, from 0.15 ounce to 1.0 ounce of fluorine in the form of an alkali salt, and an amount in excess of zero but less than 0.2 ounce of a chloride of a metal selected from the group consisting of alkaline earth metals and aluminum, and electrolytically depositing zinc on said article while it is passing through the electrolyte.

10 claims.

Legend. The moving strip carries with it into the plating bath iron salts formed during the pickling operation. I believe that the aluminum chloride reacts with the ferrous fluoride complexes with the resultant partial oxidation of some of the ferrous iron to ferric iron and precipitation of crystalline ferric fluoride.

The fluorine salt, in addition to forming iron complexes, also appears to refine the grain of the deposited zinc and to increase the cathode polarization and thereby gives an even thickness of zinc plating all the away across the ferrous metal.

References cited: U. S. Patents 901,758; 930,815; 1,554,575.

Trans. Electrochem. Soc. **50,** 211–223 (1926).

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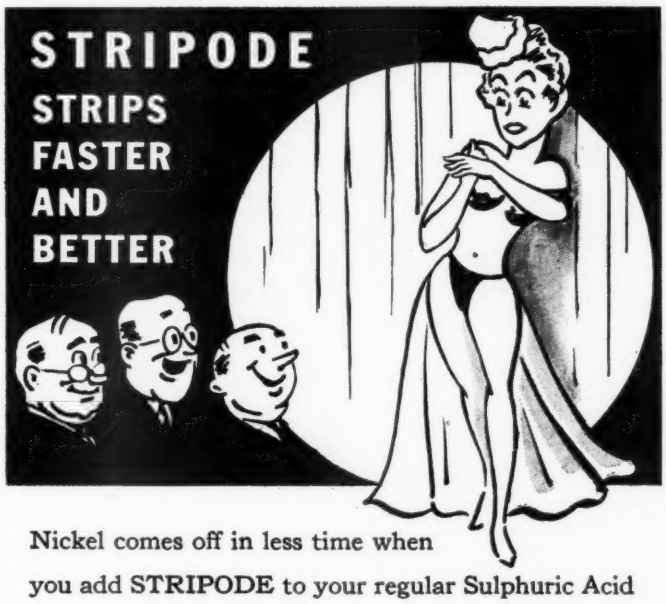

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THE CHEMICAL CORPORATION
54 Waltham Ave., Springfield 9, Mass.

USE READER SERVICE CARD; INDICATE A 722.

No. 2,444,503, July 6, 1948—Reverse Plating of Knitting Fabrics—J. L. Getaz.

CLAIM 1. In a circular knitting machine, a lower cylinder, an upper cylinder axially opposed to said lower cylinder, grooves in the outer surfaces of said cylinders, independent needles in said grooves of said lower cylinder and said upper cylinder, plating elements associated with said needles, means for feeding a plurality of yarns to said needles in plating relation, means for drawing loops of said yarns by said needles in said lower cylinder, means for holding said yarns in desired plating relation in said loops by said plating elements while said loops of said yarn are drawn by said needles in said lower cylinder, means for drawing loops of said yarn by said needles in said upper cylinder, means for holding said yarn in desired plating relation in said loops by said plating elements while said loops of said yarn are drawn by said needles in said upper cylinder.

11 claims.

No. 2,447,270, August 17, 1948—Electroplating Apparatus—R. H. Olsen.

CLAIM. In an electroplating apparatus, a tank open at its top, suspension bars of conductive material extending horizontally in said tank and insulated from each other, a base bar of insulating material extending across said tank and provided with longitudinally spaced sockets adapted to receive and removably support in upright position hollow articles to be plated constituting cathodes, uprights rising from the base bar adjacent opposite sides of the tank, a manifold pipe of conductive material extending horizontally over the base bar in upwardly spaced relation thereto and supported upon said uprights, perforated tubes removably carried by and extending downwardly from said manifold pipe and constituting anodes extending into the articles to be plated and having their upper ends communicating with the manifold pipe, said tubes being of predetermined length for disposing their lower ends in predetermined spaced relation to lower ends of said articles, a horizontally extending bus bar of conductive material, means for releasably securing the bus bar across said articles transversely thereof and in conductive engagement therewith, a vertically extending conductor strip connecting the other bar in the tank with the manifold pipe, and a pump having an inlet pipe extending into the tank and outlet pipe connected with the manifold pipe.

1 claim, 7 figures.

References cited: U. S. Patents 1,594,509; 1,759,171; 2,332,569; 2,355,236. British Patent 328,709.

No. 2,447,531, August 24, 1948—Method of Simultaneously Beaming and Electroplating Wires—R. C. Pierce, assignor to National-Standard Company.

CLAIM 1. The method of simultaneously beaming and electroplating a plurality of wires of low elastic limit and small diameter which comprises passing a plurality of separate wires from separate let-off devices simultaneously through a series of baths including a plating bath, passing an electric current through the wires whereby a thin layer of plated metal is deposited thereon from the plating bath, the wires being under common tension during plating but being laterally spaced in the plating bath and the wires being suspended throughout substantially their entire course in a catenary of small depth in which the wires form a single body wherein the wires are close together throughout substantially all of said catenary except within the plating bath, and then beaming the wires upon a take-up device connected by wires to the let-off devices.

CLAIM 2. The method as set forth in claim 1 in which the entrance of the wires to and the exit of the wires from each bath is through an overflow thereof.

2 claims, 5 figures.

References cited: U. S. Patents 242,813; 1,068,412; 1,698,512; 2,089,817; 2,093,238. British Patents 19,586; 308,649; 495,907.

No. 2,448,262, August 31, 1948—Metal Cleaning—H. N. Gilbert, assignor to E. I. du Pont de Nemours & Company.

CLAIM 7. The process of removing oxide from the surface of a steel article which comprises electrolyzing a bath of fused sodium hydroxide at 350° to 500° C with said article as cathode, separating the anode and cathode with a diaphragm, dissolving 1 per cent to 2 per cent by weight of sodium hydride in said bath in the vicinity of the cathode, bubbling hydrogen into said bath in the vicinity of the cathode at a rate sufficient to maintain a concentration of said hydride of 1 per cent to 2 per cent by weight and dissolving sodium monoxide in said bath in vicinity of the anode and maintaining said monoxide in an amount at least sufficient to react with all the water formed at the anode.

7 claims.

References cited: U. S. Patents 452,030, 827,180; 2,134,457; 2,311,099; 2,377,876. British Patent 442,859.

"Principles of Applied Electrochemistry" by Allmond, 2nd Edition (1924), pp. 498–500.

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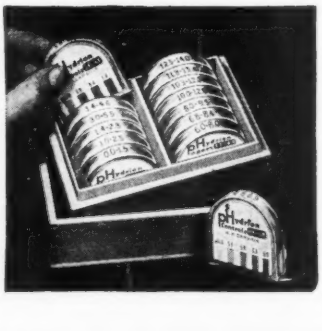

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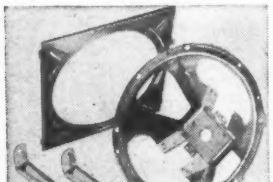

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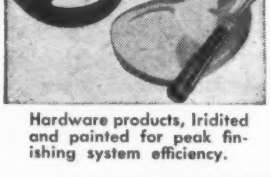

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Deplating with Voltage Control

(*Continued from page 1013*)

rapid stripping than at lower current densities. Above 4 volts in this cell, current will favor leaving from the steel rather than from the copper.

After stripping has proceeded to a point where some of the steel is laid bare, the copper area decreases and the steel area increases continuously. Operation by current density control will therefore be difficult, and voltage control is more satisfactory.

It will be noted that the exact voltage in a given electrolyte will depend on the anode-to-cathode distance and the current concentration in the solution (amperes per gallon). A laboratory cell can be constructed to represent a section of a production tank so that laboratory data will carry over to production within a fraction of a volt, but in our experience this has been shown to be unnecessary.

We have successfully operated both large and small stripping baths at 2 volts. The bath will then behave in the following manner: To start with, a current density of about 20 asf will be maintained over the copper area. As the copper dissolves and steel appears, the total current will drop because the current can leave only from the copper on which a current density of about 23 asf will be maintained. After the copper has been removed, the current will leave from the steel at a current density of 1 asf. At this point cyanide decomposition will take place due to oxidation, but the operation will not be impractical since the current density is so low.

The same principles apply to alkaline deplaters for stripping lead or tin-base alloys from steel using hot alkaline tartrate solutions as the electrolyte. Copper-lead alloys can be stripped by the use of alkaline cyanide-tartrate solutions. It will be found in the operation of any of these baths that 2 volts is a good operating voltage.

Reference Cited

F. C. Mathers and E. L. Martin. Plating 35, 569 (1948)

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Equipment & Supplies

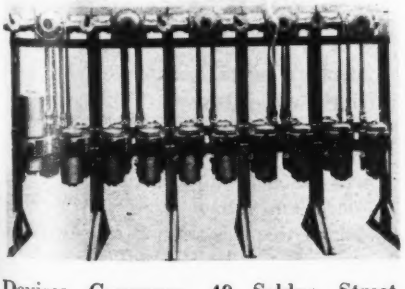
E—153. **Alkali-Emulsion Cleaner**—A new type, low-priced alkali-emulsion cleaner that will remove oils and tallow-base drawing compounds in pressure washing equipment is announced by Northwest Chemical Company, 9310 Roselawn Avenue, Detroit 4, Mich. A petroleum derivative contained in this Northwest Metal Cleaner SC-9 aids in controlling foam and the formation of rust. It is said to be particularly adapted to general washing machine use prior to bonderizing and painting and as a pre-cleaner prior to plating. For further information, use Reader Service Card.

E—154. **Variable Speed Polishing Machines**—The Standard Electrical Tool Company, 2525 River Road, Cincinnati 4, Ohio, has added to its line of Infinitely Variable Speed Buffing and Polishing Machines a Jack-Shaft construction which permits a low-speed range, or a 2-in-1 arrangement to deliver both low and high-speed.

The conventional unit has a speed range of from 1500 to 3000 rpm accomplished by means of the "Speedial" control. With the Type 3VJ2 illustrated here, a range of from 600 to 3600 rpm is available. Type 3VJ, similar to the above, is furnished only for the low speed range which can be any 2-to-1 ratio, for example, 600 to 1200 rpm, 700 to 1400 rpm, etc. These ranges are desirable in finishing of many plastics, in experimental laboratories, etc.

The illustrated Type 3VJ2 is equipped with 3-hp motor, enclosed spindle, and four ball bearings. It is also available in 1- and 2-hp sizes and optionally with the two ball bearings and open spindle construction. For further information, use Reader Service Card.

E—155. **Explosion-proof Control Equipment**—A new addition to the Emdco line of the Electro-Mechanical



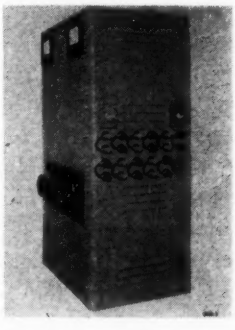
Devices Company, 49 Seldon Street, Detroit, Mich., is the final assembly of explosion-proof control equipment for use where safe, dust-proof and water-proof conditions are of first importance.

A typical installation is the assembly of five motor control groups, each providing complete control for four motors, as shown in the illustration. This assembly includes junction boxes, sealing fittings, and combination starters, all in explosion-proof, weather-proof, water-tight and dust-proof housings. While shown as free-standing, it may be designed for wall-mounting. This equipment is available with or without instrumentation.

This new Emdco service is made possible through cooperation with the Crouse-Hinds Company of Syracuse, N. Y., who manufacture explosion-proof conduit enclosures for all classes of electrical equipment. The Electro-Mechanical Devices Company will design and assemble complete explosion-proof control centers and power panels which will meet the requirements of the National Electrical Code and the most rigid local codes.

In addition to the final job of assembling various pilot devices (contactors, relays, timers, etc.) into a complete control center, Emdco offers an initial engineering service, including layout and general recommendations. For further information, use Reader Service Card.

E—156. **High-amperage Laboratory Rectifier**—W. Green Electric Company, 130 Cedar Street, New York 6, N. Y., now offers in its "Multi-Rectifier" line a series of high-amperage laboratory power



supply units designed for operation from 220 or 440 volt, 3-phase AC. The ripple content of the output is said to be only 5 per cent.

The MR1 unit, for example, incorporates six selenium rectifier sections which may be quickly interconnected to provide a choice between 0–100 amp/0–8 volt, 0–50 amp/0–16 volt, 0–35 amp/0–24 volt, and 0–18 amp/0–48 volt. Up to 96 volt are avilable in custom-built units. For further information, use Reader Service Card.

E—157. **Zinc Plating on Magnesium**—A process for depositing a thin film of zinc on magnesium alloys, developed by Dow Chemical Company, Midland, Mich., is said to permit electroplating by essentially standard techniques with chromium, silver, gold, copper, brass, cadmium, or zinc.

Initial operations remove contamination and provide correct reactive surface for good adhesion and a continuous deposit. They are followed by a bath which deposits the zinc film, and subsequent operations are done in commercial baths in the typical manner.

Excellent adhesion, wear, and resistance to accelerated corrosion are said to have been obtained, and the finish is claimed to withstand heat, humidity, and salt spray tests satisfactorily.

The company will license users.

E—158. **Bright Dip for Aluminum**—Technical Processes Division of Colonial Alloys Company, Philadelphia 29, Pa., offers a chemical immersion treatment, as distinguished from electrolytic polishing, whereby aluminum and its alloys are said to be brought to a mirrorlike finish in a few seconds' time. It is claimed often to eliminate mechanical polishing and buffing. For further information, use Reader Service Card.

E—159. **Insulated Dipping Baskets**—Automotive Rubber Company, Inc., 8623 Epworth Boulevard, Detroit 4, Mich., offers a line of insulated dipping baskets fabricated of heavy gauge, reinforced, perforated steel with welded joints and completely covered with ⅛-inch thick, shockproof, semi-hard rubber. Coverage of all faces of the hole with rubber is provided, small perforations being filled solid and drilled out.

Four sizes of perforations are offered with finished holes of ⅛, ¼, ½, and ¾ inch diameter. Four sizes of baskets in each hole size, 12 inch dia. x 12 inch depth, 10 inch x 10 inch, 8 inch x 8 inch, and 6 inch x 6 inch may be had. The rigid bails welded to the body are also rubber covered. Special sizes and shapes will be made to specifications. For further information, use Reader Service Card.

E—160. **Flame Spectrophotometer for Analysis**—A Beckman Flame Spectrophotometer has recently been announced by National Technical Laboratories, South Pasadena, Calif. The new unit greatly simplifies both qualitative and quantitative analyses of a large number of chemical elements, and its use of a hot flame is of particular value since it permits excitation of the spectral lines of a large number of elements, including many of the heavy metals and alkaline earths, whereas a cool flame instrument excites only those of the alkali metals. Its wide spectral range, covering the ultraviolet, visible and near infra-red spectral regions, insures maximum range and versatility. The instrument is adaptable to a variety of analytical problems including analyses of plating solutions.

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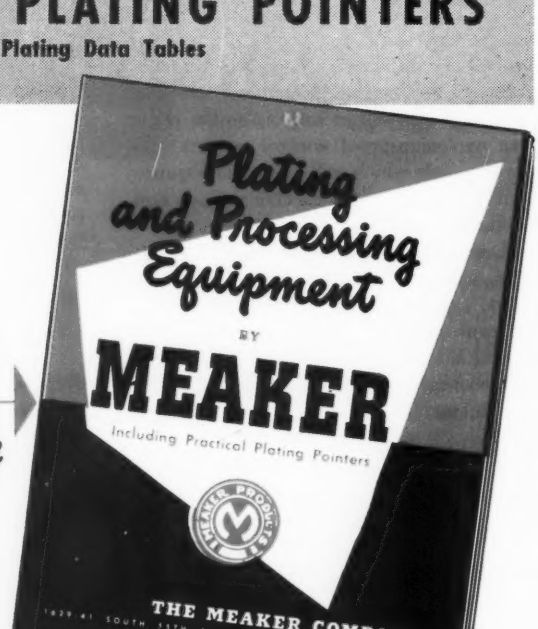

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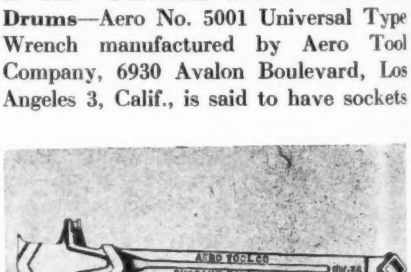
E—161. High-Production Grinding Belt—Resinall Metalite, a new heat-resistant dry-grinding belt, has just been released by Behr-Manning, Troy, N. Y., after extensive factory and field tests which are said to show production increases of 4 to 1 over the regular glue-bond material for high heat-generating operations.

Utilizing special heat-resistant, thermo-setting resin adhesives instead of the conventional glue-type adhesives, the new cloth belts are said to remain sharper for a longer time. Production increases are claimed both in number of pieces per man-hour and in number of pieces per belt. For further information, use Reader Service Card.

E—162. Universal Wrench for Steel Drums—Aero No. 5001 Universal Type Wrench manufactured by Aero Tool Company, 6930 Avalon Boulevard, Los Angeles 3, Calif., is said to have sockets



and lugs so placed as to fit all standard steel drum closures and a steel lip for removing steel caps over drum closures. The wrench, which will fit male, female, and hexagon drive closures and closures driven by internal lugs, is made of cast steel, cadmium plated to prevent sparking. For further information, use Reader Service Card.

E—163. Truck for Tote Boxes, etc.—Henry A. Techtmann, inventor, is shown

REALIZE Greater Profits with the REAL-VENT Non-Fray Ventilated Buff

The REAL-VENT Closed Face Non-Fray Ventilated Buff

The REAL-VENT Open Face Non-Fray Ventilated Buff

The REAL-VENT Non-Fray Ventilated Buff is made under patent Nos. 2,027,?63; 2,094,650; 1,573,961; Re. 19,894; 2,140,208, other patents pending

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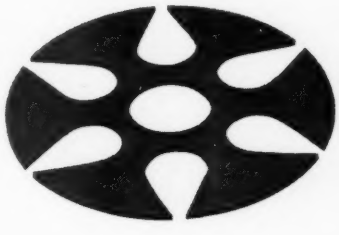
The rock-like formed "center of attraction" of the REAL-VENT Buff, although thinner than ever before, can stand great tightening pressures without twisting, buckling or compressing. Longer life means reduced buff costs.

*If a softer face is desired, ventilating spacer discs, illustrated at right, are available.



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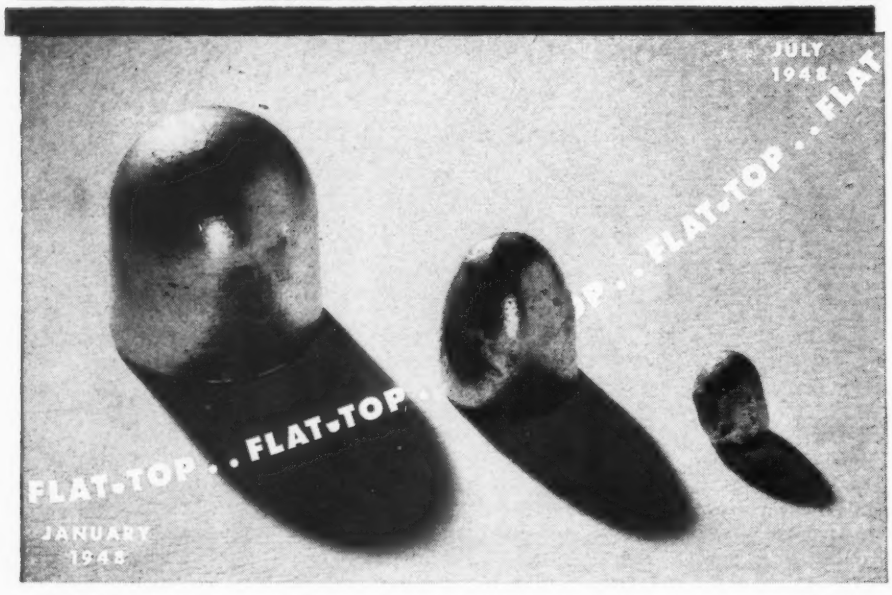

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demonstrating one of the many applications of his Hook-'N'-Haul Truck, manufactured by Techtmann Industries, 714 W. Wisconsin Avenue, Milwaukee 1, Wis.

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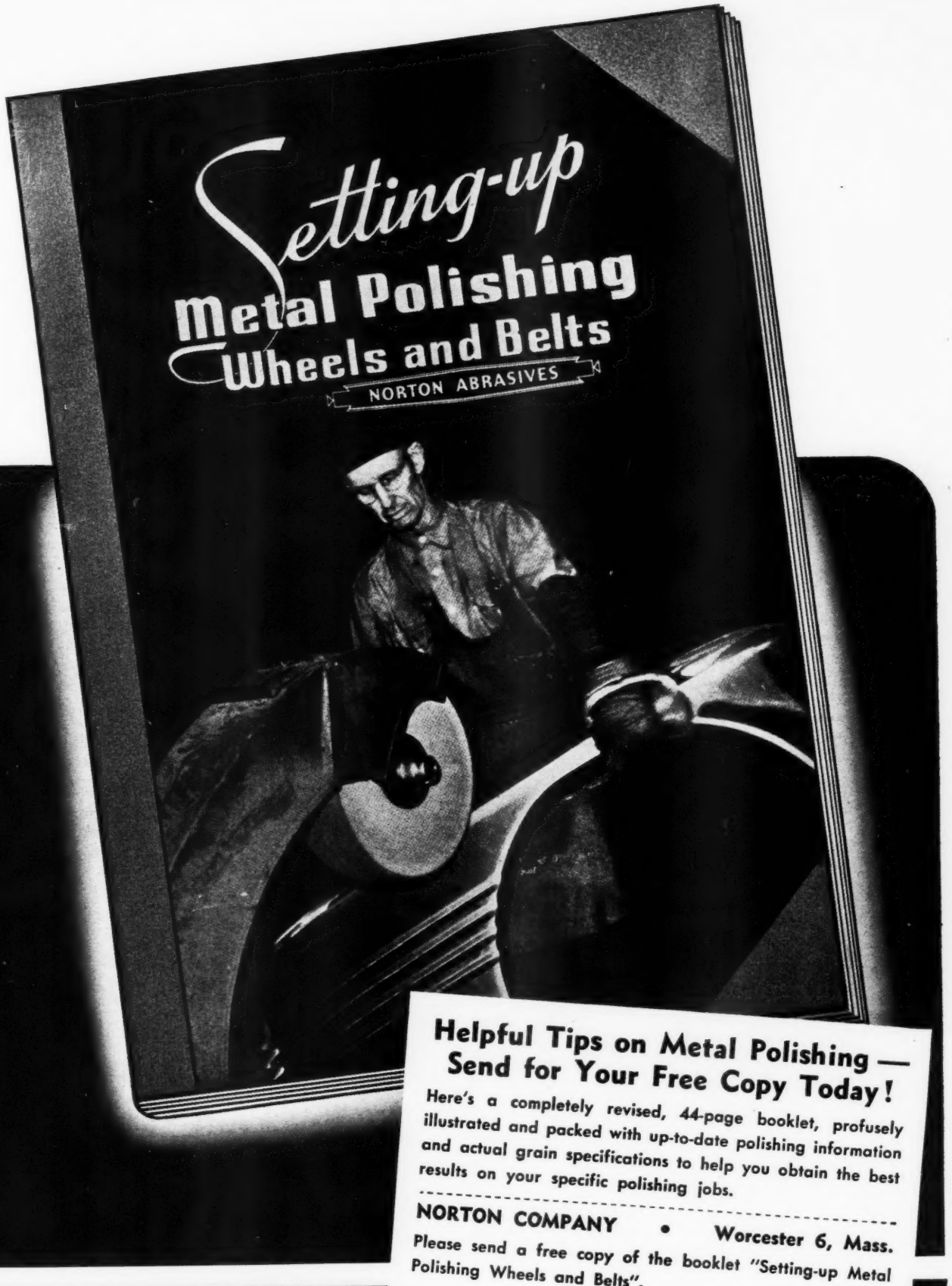
When the load is "hooked", the operator merely pulls backward and the load slides easily onto the balanced tilting carrier plate. Bulky boxes can be "tumbled" onto the carrier plate. The powerful leverage reduces the operator's effort to a minimum.

To discharge, a slight push with the hook-arm overbalances the carrier plate and allows the load to slide gently to the floor. For further information, use Reader Service Card.

E—164. "Micro-Spray" Gun — A smoother, higher-gloss finish produced by finer atomization and more even paint distribution is said to be made possible by the more uniform flow of air and paint in the "Micro-Spray" gun manufactured by Kellog Division, American Brake Shoe Company, 230 Park Avenue, New York 17, N. Y. Only one fluid needle is required for all paint spraying. Spring loaded, self-adjusting packing at fluid needle and air valve stem eliminates leakage and need for adjustment, while design of air and fluid connections permits quick, easy removal of container and hose without disturbing or damaging connections to the gun. A highly accurate control of spray width is provided by the angle of the needle. In the event a change in the pattern from horizontal to vertical is desired, the air cap can be turned freely by the fingers without loosening or adjusting air cap ring nut. Only three spray heads are needed to cover the full range of paint spray materials. Air cap and fluid nozzles have been designed so that any of the three combinations may be used for both siphon and pressure spraying. Another feature of this gun is its lightweight construction. For further information, use Reader Service Card.



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New Literature

L—121. Seeing Is Deceiving—Those who missed the intriguing display of optical illusions at the International Nickel Company Booth during the recent Atlantic City Convention of the American Electroplaters' Society are invited to get in on the fun by writing for their free copy of "Seeing is Deceiving". This entertaining and instructive booklet was designed to demonstrate that appearances can be deceiving and that quality plating depends on tests. For your copy, use Reader Service Card.

L—122. "Electrolytic Polishing and Bright Plating of Metals" is the name of a book about to be published by Messrs. Alvin Redman, Ltd., 4 Fitzroy Street, London, W. 1. The author, Dr. S. Wernick, Consulting Electrometallurgist, is the Secretary and a Past President of the Electrodepositors' Technical Society, England, and a member of American Electroplaters' Society. He has visited the United States several times. We will review his new book on these pages.

L—123. Felt Wheels and Cones—Felt wheels and cones for various polishing operations and allied products are listed and priced in a 4-page, illustrated pamphlet, issued by W. F. Bollen Company, 1 E. 42nd Street, New York 17, N. Y. For your copy, use Reader Service Card.

L—124. Electric Hoists—New and larger "Bob-Cat" electric hoists, manufactured by Lisbon Hoist & Crane Company, Lisbon, Ohio, are described and illustrated in an 8-page bulletin which contains cutaways of construction, full discussion of features, and complete specifications. For your copy, use Reader Service Card.

L—125. Cleaning of Castings—A short, illustrated article discussing "Cleaning Iron Castings by Wet Mill and Hydro-Blast" appears in Volume XXXII, Nos. 3 and 4 of the Oakite News Service. Practice at a midwestern iron foundry is discussed and the use of Oakite alkaline materials is covered in the course of the discussion. For your copy, use Reader Service Card.

L—126. Roto-Finish Manual—A new 16-page, two color, 8½ x 11 inch manual illustrating and describing Roto-Finish mechanical deburring and finishing has

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New Literature

been published by The Sturgis Products Company, Sturgis, Mich. The method is examined in detail with complete coverage of the four principal procedures which make up the process—deburring and grinding, polishing, brite-honing, and coloring.

In addition, the new booklet describes the types of parts to which the process is best applied, formulas that govern the mixtures of chips and compounds, and considerations in the selection of equipment for various applications; and offers engineering advice on parts design to gain the greatest economies by Roto-Finishing. For your copy, use Reader Service Card.

L—127. Plating of Zinc Alloy Die Castings—This book, which was reviewed in the July issue, is now being sold in United States by Finishing Publications, Inc., 11 W. 42nd Street, New York 18, N. Y.

L—128. "Bibliographic Survey of Corrosion—1945", by Robert D. Misch, James T. Waber, and Hugh J. McDonald, all of The Corrosion Research Laboratory, Illinois Institute of Technology, Chicago, Ill., is published by the National Association of Corrosion Engineers, 905 Southern Standard Building, Houston 2, Texas. 129 pages, 8½ x 11 inches, cloth binding, $4.00 per copy to members of N. A. C. E., $5.00 per copy to others.

This book contains approximately 1,100 abstracts of published articles relating to corrosion and 170 abstracts of patents which appeared from January, 1945 to February, 1946, inclusive, in Chemical Abstracts, Corrosion, Corrosion and Material Protection, Engineering Index, Industrial Arts Index, Metals Review.

The abstracts are divided into two classes, general material and patents. Each class is divided into nine main groups as follows: (1) types of attack; (2) investigations in corrosion; (3) effects of specific media; (4) effects in specific equipment; (5) resistance of materials; (6) methods of prevention; (7) coatings; (8) removal of corrosion products; and (9) general and miscellaneous considerations.

L—129. "Directory of the American Coordinating Committee on Corrosion", Fourth Issue, published in October, 1947, is now available from the National Association of Corrosion Engineers, 905 Southern Standard Building, Houston 2, Texas, price $2.00. This Directory, which occupies sixty-two 6 x 9 inch printed pages in heavy paper binding, lists the names, addresses, and fields of special endeavor of many of the principal corrosion workers in the United States and Canada. There is a cross-index system so arranged that the name and address of a specialist in some particular phase of corrosion may readily be found.

L—130. Fume Separator—The Udylite Corporation, Detroit 11, Mich., has issued an illustrated 4-page bulletin describing its Kleenaire Fume Separators, their construction and advantages. Self-contained, these units are said to eliminate expensive blowers and overhead duct work, thereby reducing ventilation cost. Since the air is cleaned and discharged inside the plant, plant heat equivalent to ¼-½ ton of coal is said to be conserved every day of an average winter month and there is no pollution of air in the neighborhood. A portion of the cleaned air may be returned under pressure to the tank for use in pusher slots, thereby permitting use of the push-and-pull type of exhaust system.

Two models are available with capacities of 1500 and 3600 cfm respectively. For your copy, use Reader Service Card.

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IN A recent survey some platers estimated that as high as 90% of the dirt in the bath was caused by the anodes. The major cause of this condition is the failure of the cotton anode bag to retain the fine particles of carbon, and also to the deterioration of the fabric.

Don't cross your fingers when you bag your anodes, when Nylon is the answer. Why? Because Nylon has four times the strength of cotton, which means less ripped bags. Nylon has four times the acid resisting qualities of cotton which means it will not deteriorate thereby retaining its normal strength for a long period of time.

Ion anode bags of Nylon will not shrink because of a special setting process, therefore no voltage drop will be noticed when in use for long periods.

Ion anode bags will not contaminate your solution because all organic impurities are removed.

Ion anode bags are made of a material woven exclusively for this purpose. They will retain anode impurities 100% because they are double sewed for double protection which means a minimum of rejects from this cause.

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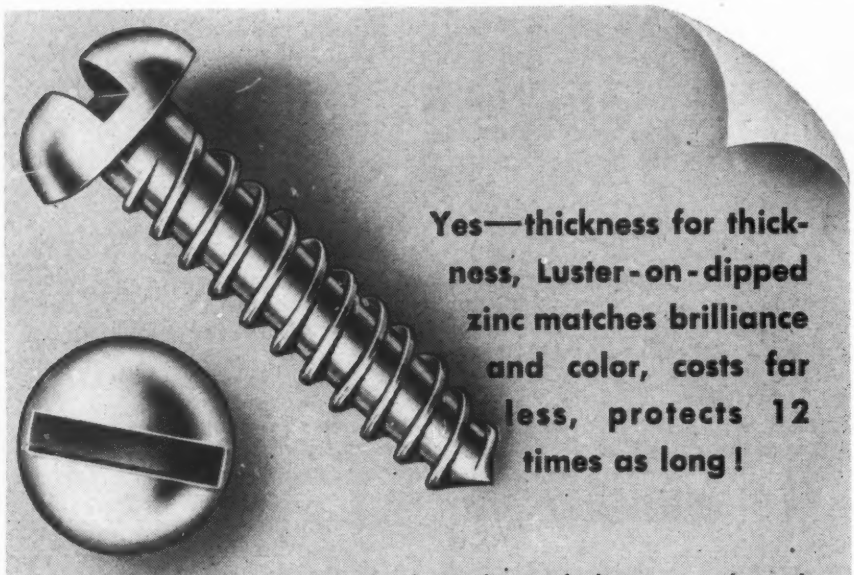

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Determination of Impurities

(*Continued from page 1022*)

latter additions must be made in the order given if consistent results are to be obtained. Aluminon must not be added when the solution is neutral or slightly basic as the results become quite erratic. The total volume of the solution before addition of the aluminon reagent should also be about the same at all times—around 75 ml.

4. The color of the aluminon lake does not develop immediately to its maximum. In fact, the maximum is not reached even after the specified one-half hour, but the rate of change has become so low that it is no longer significant from the standpoint of permitting a reading.

Summary

A method for the determination of aluminum in nickel plating baths is proposed, using the standard colorimetric procedure with aluminon reagent, after removal of interfering metals. Iron is first removed by extraction of iron cupferride with amyl acetate. The large amount of nickel present is removed by complexing with sodium diethyl dithiocarbamate followed by extraction with chloroform. The color of the aluminon lake is developed by adding aluminon and a buffer to adjust the *p*H to 5.5. After standing 30 minutes, the transmittancy of the lake is measured with a Klett-Sommerson colorimeter using the No. 54 green filter which may be purchased with the instrument.

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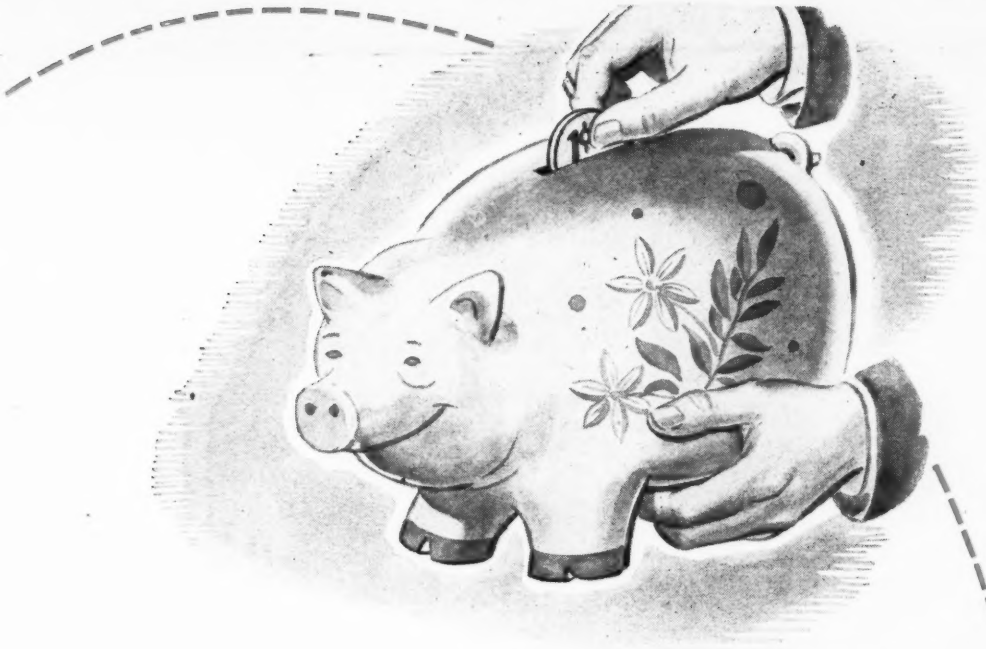

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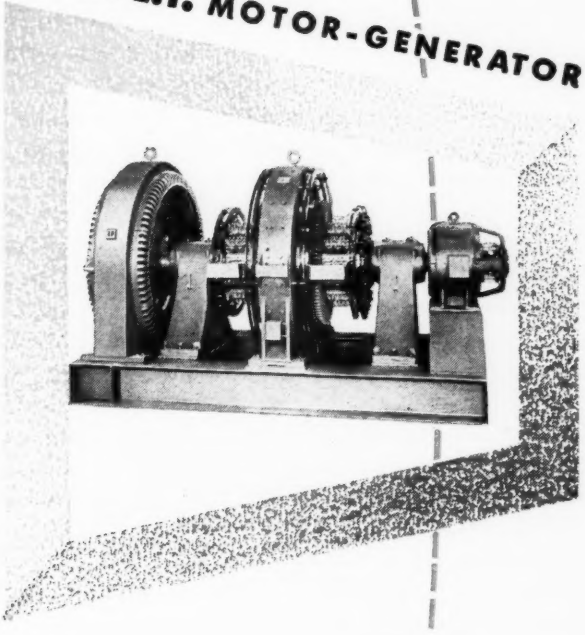

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A MESSAGE from the A.E.S. PRESIDENT

The memory of the 35th Annual Convention of the American Electroplaters' Society will linger as one of the hardest working and yet, one of the most pleasant meetings in the history of the Society. The Newark Branch was a marvelous host, and it was an action-packed meeting from the opening of the first session until the dying strains of "Home, Sweet Home" after the banquet. To single out any one activity as superb is to slight the others, which they don't deserve. The spirits of all were considerably lightened by the appearance of Horace Smith who had undergone a severe siege of illness. His full restoration to health is sincerely desired by all.

A highlight of activity was the special session devoted to consideration of a new Constitution. In four and one-half hours of intensive debate and study, a new Constitution and By-Laws were adopted, the need for which had been long apparent. To be present at this session was a rare opportunity to witness "Democracy in Action". It has been stated that the strength of a Democracy lies in its organized minority. If this be true, then the American Electroplaters' is surely a model of a democratic state. Although the debate was, at times, quite heated, no observer could discern other than an intense desire that the good of the Society be served. That, I submit, is what makes our Society great and humbles us all.

A careful study of the new Constitution will show that the basic changes from the old instrument are few. States' Rights, or Branch autonomy, have been preserved. There is no concentration of power and, in fact, safeguards have been provided against such a happening. The financial structure has been improved although all details are not yet in their proper perspective. In short, the big changes are in the Constitution and By-Laws, not in the functioning of the Society.

In addition to coming of age as a full-blown technical society, the Society has become "big business". For the first time the annual budget has exceeded $100,000 and, with the Research Committee activities included, Society transactions will total over $135,000 during this fiscal year. The whole-hearted acceptance of this budget, and the program which it embraces, by the Delegates is sincerely appreciated by the Executive Board.

The individual members of the Executive Board have already entered upon their Constitutional assignments of work for the coming year. The Educational Chairman is preparing a program for Courses in Metal Finishing. The Membership Chairman is preparing a campaign to push the number of members over the 6,000 mark before April 1. The new Third Vice-President is serving on a committee assigned to survey the problem of frequency of Industrial Finishing Expositions and effectual means of advertising the metal finishing industry. The Past President is preparing a decennial index of articles published in THE MONTHLY REVIEW and the *Proceedings*. These activities are vital in the progressive evolution of our Society and will result in every interested member being mentally enriched and his store of knowledge increased.

S. S. JOHNSTON, *President.*

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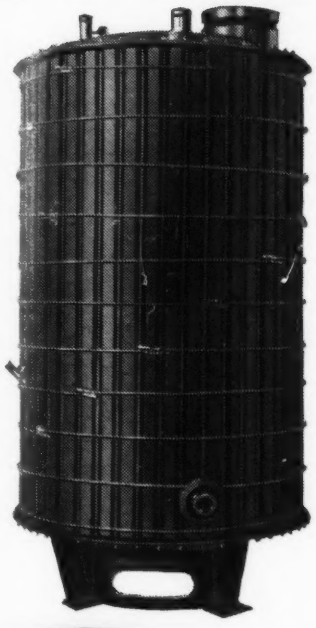

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A. E. S. News

Research Committee Appointments

MR. W. M. TUCKER of Eastman Kodak Company, Rochester, N. Y., Chairman of the Research Directing Sub-Committee, has announced the following reappointments to the Project Committees for the year 1948–1949:

Project Committee No. 2: DR. D. G. FOULKE, Hanson-Van Winkle-Munning Company, Chairman; DR. H. B. LINFORD, Columbia University; DR. W. R. MEYER, Enthone, Inc.

Project Committee No. 4: MR. M. B. DIGGIN, Hanson-Van Winkle-Munning Company, Chairman; MR. E. A. ANDERSON, New Jersey Zinc Company, MR. A. W. TRACY, American Brass Company.

Project Committee No. 5: MR. B. C. CASE, Hanson-Van Winkle-Munning Company, Chairman; MR. G. M. COLE, Fisher Body-Ternstedt Division, General Motors Corporation; MR. L. B. SPERRY, Doehler-Jarvis Corporation.

Project Committee No. 6: DR. W. A. WESLEY, The International Nickel Company, Chairman; DR. B. EGEBERG, International Silver Company; MR. A. MENDIZZA, Bell Telephone Laboratories, Inc.

Project Committee No. 8: DR. R. A. SCHAEFER, Cleveland Graphite Bronze Company, Chairman; DR. G. DUBPERNELL, United Chromium, Inc.; MR. E. HAHN, Ainsworth Manufacturing Company.

Project Committee No. 9: DR. W. BLUM, National Bureau of Standards, Chairman; MR. N. E. PROMISEL, Bureau of Aeronautics, Navy Department; MR. C. H. SAMPLE, The International Nickel Company.

Project Committee No. 10: DR. C. F. GURNHAM, Consulting Engineer, Hamden, Conn., Chairman; MR. M. A. ORR, International Silver Co.; MR. M. L. ROSS, E. I. du Pont de Nemours & Company.

Project Committee No. 11: DR. R. A. SCHAEFER, Cleveland Graphite Bronze, Company, Chairman; DR. H. J. WIESNER, C. G. Conn, Ltd.; DR. J. KRONSBEIN, Hoosier Cardinal Corporation.

The Vice-Chairmen of the Research Directing Sub-Committee are Dr. C. F. Gurnham in charge of Projects Nos. 2, 4 and 10, Mr. B. C. Case in charge of Projects Nos. 5, 8 and 11, and Dr. W. A. Wesley in charge of Projects Nos. 6, 7 and 9.

Mr. Tucker has also confirmed the appointments of Mrs. Mary Perry as A. E. S. Fellow on Project No. 2 under

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FINISH

DOES CUT
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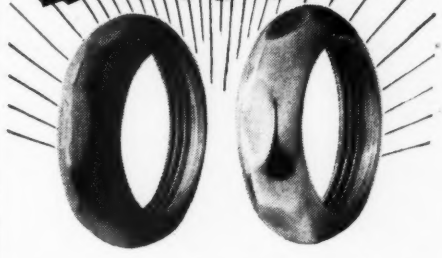
DIE CASTING COMPANY
REPORTS . . . (NAME ON FILE)

"ONE MAN CAN DE-BURR AN AVERAGE OF 12,000 PIECES IN FIVE HOURS."



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Roto-Finish eliminates the great bottleneck in modern production. Hand finishing is slow, inaccurate, and requires a large labor force. Roto-Finish processes quickly, uniformly, and without loss of tolerance, enormous quantities of intricate castings and precision parts of steel, brass, aluminum, magnesium, stainless and nickel steels. Send samples for processing. (Include finished part for guide.) No obligation.

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Dr. E. J. Serfass, Mr. William M. King on Project No. 5 under Dr. D. T. Ewing. Dr. L. Yang on Project No. 6 under Dr. N. Thon, Mr. Frederick R. Lorenz, Jr., on Project No. 7 under Dr. H. J. Read, and Mr. J. M. Milenkevich on Project No. 10 under Dr. B. F. Dodge.

Branch Speakers List A Correction

We are advised by Dr. R. J. McKay of the International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y., that his company is willing to have the Speakers, listed in the July issue, make limited speaking engagements both on the West Coast and in the South and not only in the East and Midwest as previously stated.

School for Platers in Chicago

Mr. C. Kelly, a Past President of the Chicago Branch and now a member of its Board of Managers, advises that Illinois Institute of Technology, one of the country's best metallurgical schools, has agreed to include in its curriculum an evening course in electroplating, starting in the latter part of September. Sixty members of the Chicago Branch have indicated that they will take this course this year. Institute officials are planning to repeat it every year.

The A. E. S. Manual for Electroplaters' Science Course, published in the September issue of PLATING, will be followed. The course will start with lectures only. When the additional laboratory facilities now being installed have been completed about January 1, laboratory work will be added.

Undoubtedly there are many A. E. S. Branches, not sponsoring a course at the present time, who will follow the example of the Chicago Branch. First Vice-President A. W. Logozzo, Chairman of the Society's Educational Committee, will be glad to confer with those who desire his advice on how to get started.

A Third Canadian Branch

A group of men active in the plating industry in the Windsor, Ontario area met on June 4 with the intention to organize a Windsor Branch of the American Electroplaters' Society. Temporary officers were elected with E. F. Cygan as Secretary-Treasurer, and ten applications were received from non-members of the Society.

The application of this group for a Temporary Charter has now been granted by the Executive Board.

Mr. F. L. Clifton, Secretary-Treasurer of the Detroit Branch, has been working closely with the new group and assisted in the organization. It is expected that some of the Detroit Branch members, who live on the Canadian side of the Detroit River, will transfer to the new Branch.

Our best wishes for a successful future go to the new Branch!

Henry Levine

Henry Levine, a consulting plating engineer of Metropolitan New York, passed away on Wednesday, August 11, at his home in Forest Hills, N. Y., after a long period of failing health and limited activity.

Mr. Levine was well known in the electroplating and finishing fields along the Atlantic Seaboard, especially for the bright nickel solution which bears his name, and was consultant to many manufacturing firms doing metal finishing in this area.

He had a long and varied experience in the finishing industry as foreman plater or finishing supervisor for such firms as Fredericks & Company, jewelry; Raymond & Son, silver hollowware; The Halcolite Company, lighting fixtures; and the Ideal Clamp Manufacturing Corporation, industrial clamping devices. His early technical training in Europe was continued in this country under Dr. L. C. Pan at the College of the City of New York, in chemistry and metallurgy.

He was a member of the Electrochemical Society, a twenty-five-year and an Honorary Member of the New York Branch of the American Electroplaters' Society in which he served as Librarian, Vice-President, and Trustee, and author of a number of papers presented at electroplaters' meetings. For several years he conducted a class in chemistry and analysis in the laboratory of the Golden Lighting Corporation on Grand Street, New York City, which many of the New York Branch members attended to their advantage.

Mr. Levine will long be remembered by his friends and associates for his helpful assistance and for his many contributions to their art.

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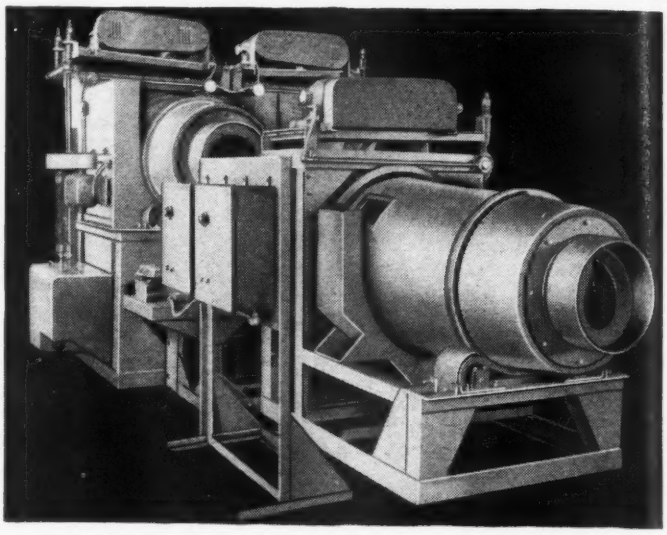

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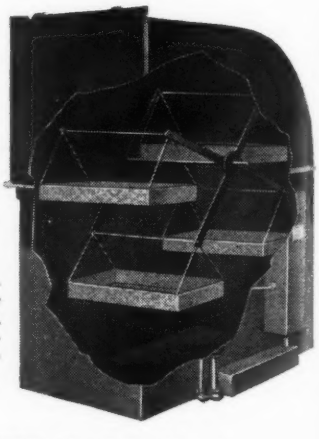

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Branch News

Coming Event

PHILADELPHIA BRANCH
ANNUAL EDUCATIONAL MEETING AND BANQUET
Saturday, November 6 in
Broadwood Hotel

Educational Session at 1:00 P. M.

Dr. William Blum, Chemist, National Bureau of Standards, "Activities of the Government in Electroplating"

Dr. Walter R. Meyer, President, Enthone, Inc., "Preparation of Metals for Electroplating"

Mr. Myron B. Diggin, Technical Director, Hanson-Van Winkle-Munning Co.

Mr. William M. Phillips, Head, Electrochemistry Section, General Motors Research Laboratories Division

Banquet in the Evening
Entertainment—Orchestra

Banquet Reservations: Write Tom Rogers, 1508 Hampstead Road, Penn Wynne, Pa., or phone Ardmore 5853-R

Hotel Reservations: Write Broadwood Hotel, Broad Street at Wood Street, Philadelphia 2, Pa., or phone Rittenhouse 6-6800

Welcome to this first affair since the War!
J. J. DUFFY, JR.

BRIDGEPORT BRANCH

Forty-two members and guests were present at the regular monthly meeting June 4.

The Banquet Committee, which reported that the Banquet and Entertainment held May 8 in Stratfield Hotel was completely successful, was tendered a rising vote of thanks. F. B. GOTTHARDT of the Branch Research Committee reported that the voluntary contributions to the Research Fund from the Branch for the fiscal year 1947–1948 mounted to $39.80; the Secretary was requested to send this sum to the Research Committee. Five new members were elected, and two members who had left the plating industry resigned. The delegates to the Convention were empowered to use their own discretion relative to the new Constitution and By-Laws.

LIBRARIAN ANTHONY J. CHENIS then conducted the question and answer period on problems of electroplating and finishing in his usual efficient manner.

JOSEPH G. STERLING, *Secretary-Treasurer.*

COLUMBUS BRANCH

The scheduled speaker at the monthly meeting on July 9 in Battelle Memorial Institute, EVANS S. SCHMELING of Wyandotte Chemical Company, was unable to attend because of illness. Instead CHARLES SLUNDER and WILLIAM NEILL, Delegates to the Convention, submitted a report to the group on happenings there. Among the items of interest were the election of Neill as Second Vice-President of the organization and that the Branch won First Exhibit Prize for a display submitted by ARCH TRIPLER and his committee of GENE COMBS and BILL NEILL.

An election was held, with WILLIAM SAFRANEK and GENE COMBS elected as representative and alternate to the Columbus Technical Council.

INDIANAPOLIS BRANCH

The regular monthly meeting on May 5 was held in the Indianapolis RCA plant.

One applicant was elected to membership. The committees active on the forthcoming dinner-dance reported good progress.

A brief introductory talk on the manufacture of phonograph records accompanied by a short film was given by FRANK A. HAMP, RCA engineer. The forty-five members and guests then toured the RCA record plant in small groups accompanied by guides who described the various phases of the work.

J. MONAGLE, *Secretary.*

MELBOURNE BRANCH

The 35th Regular Meeting took the form of an inspection of the Fairfield Mill of the Australian Paper Manufacturers, Ltd. Sufficient cars were available to transport the larger than expected crowd of thirty members from the city to the Mill, where an enthralling two hours were spent viewing the mighty machines and multitudinous processes that are used in paper making. Contracts for the chromium plating of the large rollers were signed in the imagination of those present for whom no job is too small and only a few too large, and a very much impressed party left for home at 10 P.M.

Thanks are due to the Company for arranging the visit and especially to the guides who took pains to make it a success.

JOHN J. DALE, *Honorary Secretary.*

JACKSON-LANSING BRANCH

The following is a list of officers recently elected to serve the Branch:

President—P. J. STRAIGHT
First Vice-President—L. M. HENDERSON
Second Vice-President—U. J. FORSYTH
Third Vice-President—R. W. REDMOND
Secretary-Treasurer—E. F. STREFLING
Librarian—F. W. STUCKENBERG
Assistant Librarian—D. L. SHEPARD
Board of Directors—E. J. BOSCA, MARION LONGWORTH, DR. D. T. EWING, K. KINGSLEY, MILLS DRAKE

E. F. STREFLING, *Secretary-Treasurer.*

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2—5000/2500 Ampere, B. & O'C. with Chandeysson synch. motor, 450 RPM
1—5000/2500 Ampere, Columbia, 690 RPM
1—2000/1000 Ampere, H-V-W, 690 RPM
1—1250/625 Ampere, H-V-W, 850 RPM
1—1000/500 Ampere, Chandeysson, 690 RPM
1—1000/500 Ampere, Columbia, 1150 RPM
1—1000/500 Ampere, H-V-W, 1150 RPM
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1—200 Ampere, 11/15 V. Gen. Elec.
1—180 Ampere, 14/18 V. Gen. Elec.
1—200 Ampere, 15 V. Master
1—1000 Ampere, 15 V. Gen. Elec.
1—300 Ampere, 15 V Star
1—800 Ampere, 22/33 V Gen. Elec.
3—1500 Ampere, 20 V. Elec. Prods.
1—67 Ampere, 24 V. West.
1—600 Ampere, 24 V. Reliance
1—200 Ampere, 25 V. Star
1—1000 Ampere, 25/35 V. Diehl
1—300 Ampere, 25 V. Star
1—175 Ampere, 25 V. Cr. Wh.
1—500 Ampere, 32 V. Columbia
2—100 Ampere, 30 V. Gen. Elec.
1—200 Ampere, 30 V. West.
2—200 Ampere, 32 V. Gen. Elec.
2—1500 Ampere, 32/40 V. Elec. Prods.
1—1000 Ampere, 33 V. Gen. Elec.
2—200 Ampere, 42 V. Gen. Elec.
3—1500 Ampere, 45 V. Century
1—1500 Ampere, 50 V. Gen. Elec.
2—800 Ampere, 50 V. Gen. Elec.
1—400 Ampere, 50 V. Gen. Elec.
6—1500 Ampere, 50 V. Elec. Prods.
1—1000 Ampere, 60 V. Gen. Elec.

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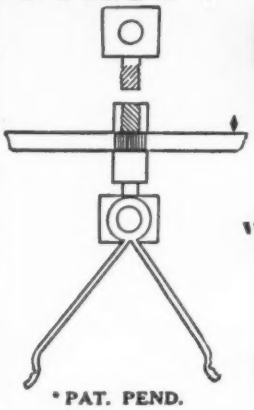

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SUSTAINING MEMBERSHIP LIST

As of August 31, 1948

(Figures in parenthesis indicate number of memberships held)

Acme Galvanizing, Inc.
Acme Manufacturing Company
Acme Plating Company, The
Acme Steel Company
Advance Pating Company, The
Alsop Engineering Corporation
Aluminum Company of America
American Brass Company
American Buff Company
American Can Company
American Chemical Paint Company
American Cyanamid Company
American Emblem Company
American Hot Dip Galvanizing Association, Inc.
American Instrument Company
American Optical Company
American Radiator and Standard Sanitary Corporation
American Smelting & Refining Company
American Wire Fabrics Corporation
American Zinc Institute (2)
Apex Plating Company
Apothecaries Hall Company
Ardco, Incorporated
Armco Steel Corporation
Arrow-Hart & Hegeman Electric Company
Auto City Plating Company
Automotive Rubber Company

Bacon Felt Company
M. E. Baker Company
Bastian-Blessing Company, The
Beaton & Corbin Manufacturing Co.
Bell Telephone Laboratories, Inc.
Belke Manufacturing Company
Berteau-Lowell Plating Works
Bethlehem Steel Company (2)
Brown & Bigelow
Brown-Hutchinson Iron Works
Buckingham Products Company (2)

Canadian Hanson & Van Winkle Company, Limited
Carey-McFall Company
Casco Products Corporation
Chase Brass & Copper Company
Chemical Corporation, The
Chicago Electro-Platers Institute
Christie Plating Company
Chrome-Rite Company (2)
Chromium Corporation of America
Chromium Process Company, The
Chrusler Corporation (2)
Cinch Manufacturing Corporation
Cleveland Graphite Bronze Company, The
Clinton Company, The
Codman, F. L. & J. C., Company
Corona Corporation
Cowles Chemical Company
Croname, Incorporated
Crown Cork and Seal Company
Crown Rheostat and Supply Company

Darco Corporation
Daystrom Corporation
Detrex Corporation
Divine Brothers Company
Dixie Electro Plating Company
Doehler-Jarvis Corporation (2)
R. R. Donnelly & Sons Company
E. I. du Pont de Nemours & Company (2)
Dura Company
Dura-Chrome of Chicago, Inc.

Eastman Kodak Company
Eaton Chemical & Dyestuff Company
Eaton Manufacturing Company
Electric Auto-Lite Company, The (2)
Electrolux Corporation
Ellmore Silver Company, Inc.
Empire Electro Plating Supplies Corporation
Enthone, Inc.
Erie Plating Company

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Finishing Publications, Inc.
Ford Motor Company (5)
Formax Manufacturing Company
Frigidaire Division, General Motors Corporation

Gemex Company
General Electric Company
General Motors Corporation (5)
Gerity-Michigan Corporation
Gillette Safety Razor Company
Gordon Manufacturing Company, The
Gorham Manufacturing Company
Graham, Crowley & Associates, Inc.
Graham Plating Works
Great Lakes Plating Company
Frederick Gumm Chemical Company (2)

Hamilton Watch Company
Hammond Machinery Builders, Inc.
A. H. Hannon
Hanson-Van Winkle-Munning Co. (2)
Harshaw Chemical Company, The (2)
Haviland Products Company
Heil Process Equipment Corporation
Hodecker Brothers
Houdaille-Hershey Corporation (3)
Hub Plating Works
Hudson Motor Car Company
Hunter Pressed Steel Company
Hy-Grade Plating Company

Illinois Watch Case Company
Industrial Filter and Pump Manufacturing Company
International Business Machines Corporation
International Nickel Co., Inc., The (5)
International Silver Company
F. L. Jacobs Company

Jones and Laughlin Steel Corporation

Kelly Plating Company, The
Knape & Vogt Manufacturing Company
Kocour Company
Kohler Company
Kuehne Manufacturing Company
Lasalco, Inc.
Lea Manufacturing Company, The
Leeds & Northrup Company
Chas. F. L'Hommedieu & Sons Company
Lionel Corporation
Lux Clock Manufacturing Company, The

Maas & Waldstein Company
W. D. MacDermid Chemical Company
MacDermid, Incorporated
Magnuson Products Corporation
Manderscheid Company, The
Matchless Metal Polish Company, The
Mattatuck Manufacturing Company
Maxson Company
McGean Chemical Company, The
McKinney Manufacturing Company
McKinney Manufacturing Company
Meaker Company, The
Mechanical Plating Company
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Metal Finishers, Inc.
Metal Mouldings Corporation
Metal Process Corporation (2)
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Minneapolis-Honeywell Regulator Co.
Mitchell-Bradford Chemical Co., The
Modern Plating Company, The
Moore Drop Forging Company
Motor Products Corporation
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Mutual Chemical Company of America

George L. Nankervis Company
Nash-Kelvinator Corporation
National Aniline Division, Allied Chemical and Dye Corporation
National Brass Company
National Cash Register Company, The
National Lock Company
National Screw and Manufacturing Company, The
New England Buff Company
New England Plating Company
New Jersey Zinc Company (3)
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Noblitt-Sparks Industries, Inc.
Northwest Chemical Company (2)
Nutmeg Chrome Corporation

Oakite Products, Inc. (2)
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Pape Electro Plating, Inc.
Parker Rust-Proof Company
Parker-Wolverine Division, The Udylite Corporation

(Continued on page 1068)

wonderful

Oakite Composition No. 90

for reverse-current cleaning

YOU never know how good an electrocleaner can be until you watch Oakite Composition No. 90 go to work on oils, greases, smuts, all the objectionable films that interfere with good electroplating on steel.

"No. 90" makes a well-balanced solution that does everything just right. It has high conductivity that keeps oxygen bubbling off the work, prying dirt loose at a rapid rate. It has good wetting and dispersing action. It has plenty of buffering and water-softening ability. Even its bubbles are perfect—just strong enough to keep alkaline spray from being a nuisance around the tank; just brittle enough to prevent the development of thick explosive foam. In short, Oakite Composition No. 90 has every quality needed for good electrocleaning at low cost per unit.

Free Demonstration

To see Oakite Composition No. 90 in action just telephone the Oakite Technical Service Representative in your vicinity or write direct to us.

OAKITE PRODUCTS, INC., 40 Thames St., NEW YORK 6, N. Y.
Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE
REG. U. S. PAT. OFF.

Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

1066 USE READER SERVICE CARD; INDICATE A 749.

McKeon's

Zinc-Brite
TRADE MARK REG'D.

1. CLEANSES and PURIFIES zinc solutions.
2. IMPROVES appearance of zinc.
3. CUTS DOWN on expensive "zinc brighteners."

Learn about it—No obligation

Sulphur Products Co. Inc.
Greensburg, Pa. 9

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 750.

AVAILABLE FOR IMMEDIATE SHIPMENT
ATTRACTIVE VALUES

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS, WITH FULL CONTROL EQUIPMENT:

1—15,000/7500 AMPERE, 6/12 VOLT, **COLUMBIA ELECTRIC CO.,** Late t Design Unit, with Separate M. G. Exciter.
1—10,000/5000 AMPERE, 12/24 VOLT, **CHANDEYSSON,** Synchronous Motor, Very Latest Design, 5 years old, Like New.
1—10,000/5000 AMPERE, 9/18 VOLT, **CHANDEYSSON,** Synchronous Motor, Very Latest Design, 5 years old, Like New.
1—6000 AMPERE, 6 VOLT, **JANTZ & LEIST** Unit. Induction Motor Drive. Excellent Condition.
2—5000/2500 AMPERE, 6/12 VOLT, **A. P. MUNNING CO.** "OPTIMUS" Design, Separately Excited.
1—4000/2000 AMPERE, 6/12 VOLT, **HANSON & VAN WINKLE CO.,** Compound Wound, Separately Excited.
1—3000/1500 AMPERE, 6/12 VOLT, **HANSON-VAN WINKLE-MUNNING CO.,** Latest Design, Synchronous Motor, like new.
1—2000/1000 AMPERE, 6/12 VOLT, **CHANDEYSSON,** Latest Design Synchronous Motor, like new.
1—2000/1000 AMPERE, 12/24 VOLT, **HANSON & VAN WINKLE CO.,** Interpole Design, Separately Excited.
1—1500/750 AMPERE, 6/12 VOLT, **CHANDEYSSON,** Latest Design. Synchronous Motor, good as new.
1—1000 AMPERE, 6/12 VOLT **ELECTRIC PRODUCTS CO.,** Separately Excited, Ball Bearing Design.
4—1000/500 AMPERE, 6/12 VOLT **CHARLES J. BOGUE ELECTRIC CO.,** Separately Excited. Interpole Design.

LARGE SELECTION OF SMALLER SIZES IN STOCK. WRITE FOR DETAILS.

1—2000 AMPERE, 6 VOLT, **GREEN** "SELECTROPLATER" BUILT-IN REGULATOR, 220/440 volt, 3 phase, 60 cycle input.
1—2000 AMPERE, 6 VOLT, **GENERAL ELECTRIC CO.** RECTIFIER, with controls. 220/3/60 input.
1—1440/720 AMPERE, 6 VOLT, **UDYLITE MALLORY** RECTIFIER. 220/3/60 input.
7—500 AMPERE, 6 VOLT, **GENERAL ELECTRIC** RECTIFIERS, 220/3/60 input, with Regulators.
12—400 AMPERE, 6 VOLT, **UDYLITE MALLORY** RECTIFIERS. Built-in Regulators, 220/3/60 input.

M. E. BAKER CO. 143 SIDNEY STREET CAMBRIDGE, MASS.

USE READER SERVICE CARD; INDICATE A 751. PLATING

Membership Report

of the American Electroplaters' Society

Elections

BUFFALO BRANCH: A. J. Gude
INDIANAPOLIS BRANCH: Ormal G. Ammerman
MELBOURNE BRANCH: L. A. Ponsford, J. N. Flavell
NEW YORK BRANCH: Kenneth F. Miltner, Harry R. Powers, Edmund S. Roszkowski, George D. Waring, V. L. Wilker
PHILADELPHIA BRANCH: James E. Cogan, Jr.
PROVIDENCE-ATTLEBORO BRANCH: George G. Cota, Frederick G. Heeley
ROCHESTER BRANCH: Ernest O. Olds
ST. JOSEPH VALLEY BRANCH: Elmer Hagerty, Walter T. Schaub
SYDNEY BRANCH: J. V. McAuliffe, P. G. Phipps, C. E. Pursehouse, L. Turner
SYRACUSE BRANCH: George Ball, Stephen Egged, Raymond Greabell, Frank Jenks, Stanley Kalb, Francis W. King, Kenneth S. Parnell, Paul F. Vicari
OTHER: David Mitchell

Reinstatements

CHICAGO BRANCH: John Kronsbein
OTHER: H. L. Bache

Transfers

Howard E. Schearer from Philadelphia Branch; John G. Benson to Syracuse Branch

Resignations

BUFFALO BRANCH: James C. Mays
PROVIDENCE-ATTLEBORO BRANCH: Louis Luther
SPRINGFIELD BRANCH: Frederick G. Webber
SYRACUSE BRANCH: Frank Corso, G. O. Miller
OTHER: Walter R. Beesley

Suspensions

ROCHESTER BRANCH: Charles H. Burnett
ST. JOSEPH VALLEY BRANCH: Robert F. Aller, Stanley M. Bailey, Clair E. Bunyan, Keith Doran, Leslie Doty, Julius A. Farkus, James E. Gray Paul

MEMBERSHIP CHART

	Membership May 1, 1948*	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
CLEVELAND	190	10	+10	+ 5.3
TORONTO	143	5	+ 6	+ 4.2
PHILADELPHIA	205	7	+ 6	+ 2.9
BRIDGEPORT	154	6	+ 4	+ 2.6
BOSTON	163	3	+ 3	+ 1.8
DETROIT	399	6	+ 6	+ 1.5
NEWARK	273	5	+ 1	+ 0.4
LOS ANGELES	234	..	.....	.....
GRAND RAPIDS	140	..	− 2½	− 1.8
CHICAGO	453	8	− 9	− 2.0
NEW YORK	270	6	− 9	− 3.3
PITTSBURGH	149	..	− 9	− 6.0
WATERBURY	128	2	−11½	− 9.0
HARTFORD	152	..	−19½	−12.8
SECOND GROUP				
SYDNEY	91	18	+19	+20.9
BUFFALO	96	5	+ 3½	+ 3.6
MILWAUKEE	120	6	+ 3½	+ 2.9
PROV.-ATTLEBORO	117	5	+ 2	+ 1.7
TWIN CITY	77	2	+ 1	+ 1.3
INDIANAPOLIS	103	1	+ 1	+ 1.0
SAN FRANCISCO	77	..	.....	.....
DAYTON	90	..	.....	.....
ST. LOUIS	103	..	.....	.....
NEW HAVEN	110	..	.....	.....
ST. JOSEPH VALLEY	98	..	− ½	− 0.5
BALTIMORE-WASH.	97	..	− 4½	− 4.6
ROCHESTER	120	3	− 9½	− 7.9
CINCINNATI	80	2	−12½	−12.8
THIRD GROUP				
SAGINAW VALLEY	38	5	+12½	+32.9
MELBOURNE	67	10	+10	+14.9
COLUMBUS	38	5	+ 4½	+11.8
LOUISVILLE	18	2	+ 2	+11.1
ADELAIDE	66	10	+ 7	+10.6
MONTREAL	63	3	+ 3½	+ 5.6
LANCASTER	46	1	+ 1	+ 2.2
SYRACUSE	66	8	+ ½	+ 0.8
ROCKFORD	59	..	.....	.....
JACKSON-LANSING	64	..	− ½	− 0.8
SPRINGFIELD	53	..	− 1	− 1.9
TOLEDO	73	..	− 2½	− 3.4
SOUTHEASTERN	49	2	− 5	−10.2
OTHERS	113	27	+22½	+19.9
TOTAL A. E. S.	5,249	174	+36	+ 0.7

Active Membership, September 5, 1948 5,285

*These figures are taken from the Annual Report and are subject to corrections as further information becomes available and checked.

Membership Report

(*Continued from page 1067*)

Grimm, George Hansen, Lawrence D. Hoppes, Allen L. Light, Ralph P. Raiford, Clare Ransbottom, John W. Sprong

SYRACUSE BRANCH: Harwood Chase, Mannie F. Costa, William Mahar, Norman F. Prince, John F. Roth

WATERBURY BRANCH: Frederick Batten, Charles M. Di Stiso, Edward Dowling, Melton B. Gelfand, John C. Goddard, 3rd, Harold B. Lane, Howard W. Miller, Everett M. Patterson, William A. Skene, Louis M. Ursini

Deaths

NEW YORK BRANCH: Henry Levine

WATERBURY BRANCH: T. H. Webersinn, Frederick W. Swallwell

Sustaining Membership List

(*Continued from page 1065*)

Parts Manufacturing Company
Pennsylvania Salt Manufacturing Company, The
Pheoll Manufacturing Company
Philadelphia Rust-Proof Company
Plating Products Company, The
Platers Supply Company
Proctor Electric Company
Products Finishing

R. C. A. Victor Division, Radio Corporation of America

Remington Rand, Inc.
Reo Motors, Inc.
Reynolds-Robson Supply Company (2)
Roberts Rouge Company
Royal Plating and Polishing Company

Sargent and Company
Schick, Inc.
Scoville Manufacturing Company
J. P. Seeburg Corporation
E. E. Seeley Company, Inc.
Seth Thomas Clocks Division, General Time Instruments Corporation
Seymour Manufacturing Company, The
J. J. Siefen Company
Silverman Brothers
Speakman Company
Spectranome Plating Company
Standard Oil Company (Indiana)
Standard Plating Rack Company
Standard Plating Works
Standard Steel Spring Company (3)
Stanley Works, The
Frederic B. Stevens, Inc. (2)
Sturgis Products Company, The
George A. Stutz Manufacturing Company
Superior Plating and Rust Proofing Company
Superior Steel Corporation
Sylvania Electric Products, Inc.

Talon, Inc.
Taylor Instrument Companies
Thomas & Son Company, The
Thomas Brothers, Inc.
Thomas Steel Company, The
Trico Products Corporation

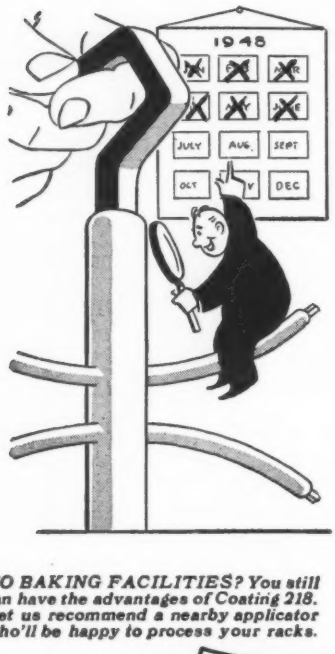
Udylite Corporation, The (5)
Uncas Manufacturing Company
Union Hardware Company
United Chromium, Inc. (2)
United Platers, Inc.
United States Spring & Bumper Company
United States Time Corporation, The

Van Der Horst Corporation of America

A. T. Wagner Company
Wagner Brothers
Wald Manufacturing Company
R. Wallace & Sons Manufacturing Company
Walton & Lonsbury
Waterbury Companies, Inc.
Waterbury Plating Company
Waterbury-Rolling Mills, Inc.
Weirton Steel Company
W. W. Wells, Limited
Western Electric Company
Western Rustproof Company
Westinghouse Electric Corporation
Wheeler Industries, Inc.
Whitney Blake Company
Willys-Overland Motors, Inc.
Winchester Repeating Arms Company
Winters & Crampton Corporation
Wollensak Optical Company
Wolverine Brass Works
Worcester Brass Electro Plating Company
Wyandotte Chemicals Corporation

Yankee Metal Products Corporation

RACK COATING UPKEEP: ZERO!



A report on Unichrome Coating "218" shows no maintenance in 6 months!

In an Ohio plant, racks on a nickel line, which included an extra severe cleaning cycle, gave this plater money-saving evidence of Coating 218's service life. For 6 months, maintenance work—always a big item—had dropped off to nothing, with the original racks still giving good service!

Have *you* tried and compared this advanced type of rack coating to see the savings possible with it? Many well-known companies everywhere, who did, have made it their standard coating. Unichrome Coating 218 has 100% solids. On baking, it forms a heavy, elastic coating that withstands rough handling and severest plating cycles. Write for full data.

NO BAKING FACILITIES? You still can have the advantages of Coating 218. Let us recommend a nearby applicator who'll be happy to process your racks.

UNICHROME
Trade Mark Reg. U. S. Pat. Off.

RACK COATINGS—Products of
UNITED CHROMIUM, INCORPORATED • 51 E. 42nd St., New York 17, N.Y.
Detroit 7, Mich. • Waterbury 90, Conn. • Chicago 4, Ill. • Dayton 2, Ohio • Los Angeles 13, Cal.

Directory

Officers and Branches of the American Electroplaters' Society

A. E. S. OFFICERS

President.....S. S. JOHNSTON
Weirton Steel Company, Weirton, W. Va.

First Vice-President.....A. W. LOGOZZO
Nutmeg Chrome Corporation,
79 Chapel Street, Hartford 3, Conn.

Second Vice-President.....W. J. NEILL
Columbus Metal Products, Inc.,
767 W. 4th Street, Columbus 8, Ohio

Third Vice-President.....C. F. NIXON
Fisher Body-Ternstedt Division, G. M. C.,
6307 W. Fort Street, Detroit 9, Mich.

Past President.....K. M. HUSTON
3208 Tyndale Avenue, Baltimore, Md.

Executive Secretary.....A. K. GRAHAM
P. O. Box 168. Jenkintown, Pa.

LOCAL BRANCHES

ADELAIDE, AUSTRALIA. Secretary, C. J. Cocks, 37 Myal Avenue, Kensington Gardens, S. A., Australia.

ALLENTOWN-READING meets third Thursday of each month. Secretary, H. E. Fennell, Box 628, R. D. 2, Reading, Pa.

BALTIMORE-WASHINGTON meets second Tuesday of October, December, February, and April in Baltimore, and of November, January, March, and May at the National Bureau of Standards, Washington, D. C. Secretary, Fielding Ogburn, 9607 Riley Place, Silver Spring, Md.

BOSTON meets first Thursday of each month in Hotel Statler. Secretary, Dr. George P. Swift, 53 Galen Street, Watertown 72, Mass.

BRIDGEPORT meets first and third Friday of each month in Barnum Hotel. Secretary-Treasurer, Joseph G. Sterling, 134 Colony Street, Bridgeport 8, Conn.

BUFFALO meets second Friday of each month in Markeen Hotel. Secretary, H. A. Fudeman, 534 W. Ferry Street, Buffalo 13, N. Y.

CHICAGO meets second Friday of each month at 8 P. M. in Atlantic Hotel. Secretary-Treasurer, J. M. Andrus, 3701 Ravenswood Avenue, Chicago 13, Ill.

CINCINNATI meets fourth Wednesday of each month at 8 P. M. in Engineering Society Headquarters, McMillan Street and Woodburn Avenue. Secretary-Treasurer, H. Roper Davis, 3610 Zumstein Avenue, Cincinnati 8, Ohio.

CLEVELAND meets first Friday of each month in Cleveland Hotel at 8 P. M. Secretary-Treasurer, Harry Pochapsky, 24901 Euclid Avenue, Cleveland, Ohio.

COLUMBUS meets first Friday of each month at 8 P. M. in Battelle Memorial Institute Auditorium. Secretary-Treasurer, W. G. Hespenheide, 505 King Avenue, Columbus 1, Ohio.

DAYTON meets second Friday of each month in Engineers' Club. Secretary-Treasurer, Elmar W. Rehme, 505 Commercial Building, Dayton 1, Ohio.

DETROIT meets first Friday of each month in Hotel Statler. Secretary-Treasurer, F. L. Clifton, 16536 Inverness, Detroit 21, Mich.

GRAND RAPIDS meets second Friday of each month at 7:30 P. M. in Rowe Hotel. Secretary, Jacob M. Hage, 1327 Jefferson Avenue, S. E. Grand Rapids, Mich.

HARTFORD meets third Monday of each month in Hotel Bond. Secretary, Ralph D. Chase, 62 Bloomfield Avenue, Windsor, Conn.

INDIANAPOLIS meets first Wednesday of each month at Fox Steak House, 1207 Washington Street Secretary-Treasurer, Dr. A. M. Max, 6157 Park Avenue, Indianapolis, Ind.

JACKSON-LANSING meets second Tuesday of each month at Home Dairy Company in Lansing. Secretary-Treasurer, E. F. Strefling, 1423 Kelsey Avenue, Lansing 10, Mich.

LANCASTER meets second Friday of each month at 8 P. M. in Thaddeus Stevens Industrial School. Secretary-Treasurer, Chester W. Smith, c/o American Wire Fabrics Co., Mt. Wolf, Pa.

LOS ANGELES meets second Wednesday of each month at 6:30 P. M. in Scully's Restaurant. Secretary, George M. Kent, 791 E. 15th Street, Los Angeles 21, Calif.

LOUISVILLE meets third Wednesday of each month in the 235 Club, 235 S. 5th Street. Secretary-Treasurer, Stanley J. Beyer, c/o Hart Manufacturing Company, 2006 North Western Parkway, Louisville 3, Ky.

MELBOURNE, AUSTRALIA meets fourth Monday of each month at 8 P. M. in Chamber of Manufactures, 312 Flinders Street. Hon. Secretary-Treasurer, John J. Dale, c/o Munition Supply Laboratories, Maribyrnong, Victoria, Australia.

MILWAUKEE meets first Friday of each month in Red Araow Club, 774 N. Broadway. Secretary-Treasurer, Harry J. Krueger, 1333 S. 71st Street, Milwaukee 14, Wis.

MONTREAL meets first Tuesday of each month in Mount Royal Hotel. Secretary-Treasurer, B. Mendels, c/o Empire Glass Works Company, 425 River Street, Verdun 19, Quebec, Canada.

NEWARK meets first and third Friday of each month at 8 P. M. in Hotel Robert Treat. Secretary-Treasurer, George Wagner, 1130 S. Long Avenue, Hillside, N. J.

NEW HAVEN meets second Tuesday of each month alternating between Sterling Chemistry Laboratory, Yale University, and Hotel Taft. Secretary-Treasurer, B. J. Gaffney, 40 Filbert Street, Spring Glen, Hamden 14, Conn.

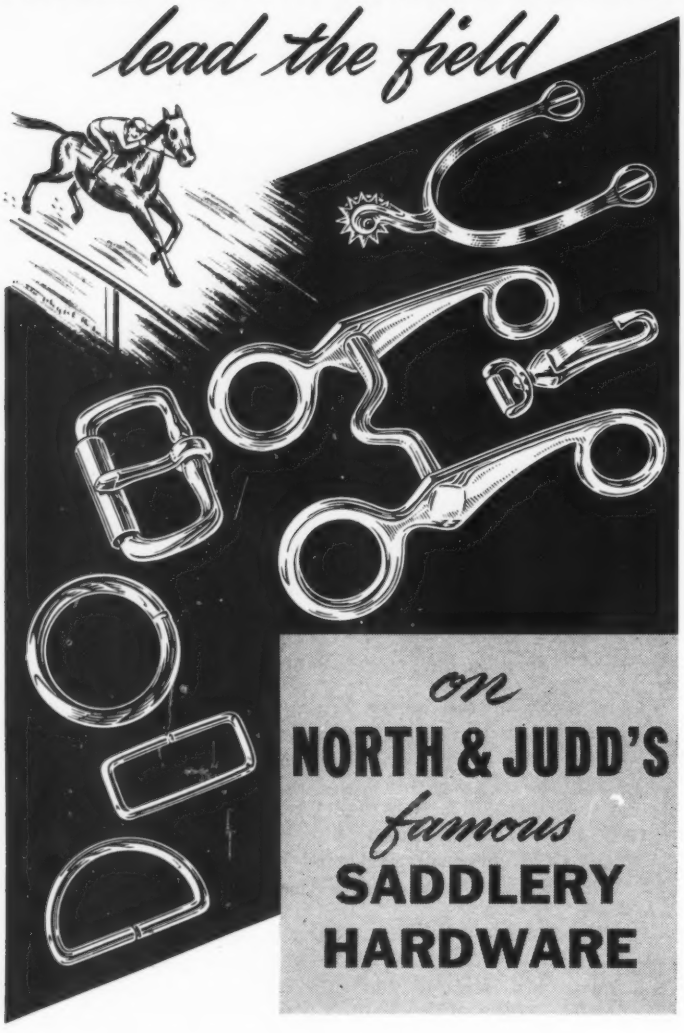
NEW YORK meets second and fourth Fridays of each month in Hotel Pennsylvania. Secretary-Treasurer, Franklyn MacStoker, 25 Princeton Street, Garden City, L. I., N. Y.

PHILADELPHIA meets fourth Friday of each month in Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Streets. Secretary, I. William Marcovitch, 1434 Lardner Street, Philadelphia 24, Pa.

(Continued on page 1070)

NUCAST 99+% NICKEL ANODES

lead the field



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FROM RACE TRACKS TO FARMS, in fact everywhere horses are used, world famous North & Judd Saddlery Hardware leads the field.

One reason for its popularity is the Nucast Nickel Finish . . . smooth, durable, eye appealing . . . insuring years of service under all conditions.

NUCAST 99+% Nickel Anodes are quicker starting . . . fast corroding with greater yield of nickel . . . insure smoother, thicker deposits. North & Judd have been using Nucast Anodes for nearly forty years . . . evidence of fine quality . . . high uniformity and complete satisfaction.

Take the advice of the leaders and specify Nucast 99+% Nickel Anodes on your next order.

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APOTHECARIES HALL CO.

WATERBURY 88 CONN.

Branch Directory

(*Continued from page 1069*)

PITTSBURGH meets third Thursday of each month at 6:3 P. M. in Keystone Hotel. Secretary-Treasurer, G. B. Bowm 1510 Ridge Avenue, Coraopolis, Pa.

PROVIDENCE-ATTLEBORO meets third Monday of eac month in Providence-Biltmore Hotel. Secretary-Treasure Dr. Edward A. Parker, 15 Vale Avenue, Cranston 10, R. I.

ROCHESTER meets third Friday of each month in Hot Seneca. Secretary, James Weaver, 884 Whitelock Road Rochester 9, N. Y.

ROCKFORD meets second Monday of each month in Faus Hotel. Secretary, Vern T. Wissen, Forest Hills Road, Rock ford, Ill.

SAGINAW VALLEY meets for dinner at 7:00 P. M. and meet ing at 8:00 P. M. at Rollie McNivens, Frankenmuth, Mich second Wednesday of each month except October, January and April (third Wednesday) and December (no meeting) Secretary, L. J. Minbiole, 533 Copeman Boulevard, Flint 4, Mich.

SAN FRANCISCO meets second Thursday of each month alternating between El Jardin Restaurant, 22 California Street San Francisco, and El Curtola Restaurant, 510 17th Street Oakland. Secretary-Treasurer, Fred P. Dartt, 1222 42nd Avenue, Oakland 1, Calif.

SPRINGFIELD meets fourth Monday of each month in Hote Charles. Harold Oehler, Pleasant Street, Granby, Mass.

ST. JOSEPH VALLEY meets first Wednesday of each month at 8 P. M. in Hotel Elkhart, Elkhart, Ind. Secretary-Treasurer, Victor E. Peterson, 1641 Hickory Street, Niles, Mich.

ST. LOUIS meets second Wednesday of each month in York Hotel. Secretary-Treasurer, E. R. Hunleth, 4415 Michigan Avenue, St. Louis, Mo.

SOUTHEASTERN meets second Thursday of each month in Robert Fulton Hotel, Atlanta, Ga. Secretary, William Weymouth, 173 Clay Street, S. E., Atlanta, Ga.

SYDNEY, AUSTRALIA. Secretary-Treasurer, John R. Godfrey, P. O. Box 31, Auburn, N. S. W., Australia.

SYRACUSE meets fourth Monday of each month in Bowne Hall, Syracuse University. Secretary, Vincent P. McConnell, 269 Whittier Ave., Syracuse 4, N. Y.

TOLEDO meets first Thursday of each month at Commodore Hotel. Secretary Gaston, Bergeman, 703 Pine Street, Fremont, Ohio.

TORONTO meets second Friday of each month in Royal York Hotel. Secretary, Herbert Skelton, c/o John Inglis Company 14 Strachan Svenue, Toronto, Canada.

TWIN CITY meets first Monday of each month, October through June, in Covered Wagon Cafe, Lodge Room, 114 S. 4th Street, Minneapolis. Secretary-Treasurer, Robert L. Buckley, 318 Builders Exchange, Minneapolis 2, Minn.

WATERBURY meets second Friday of each month in Elton Hotel. Secretary-Treasurer, Spencer L. Henn, P. O. Box Dr. B, Cheshire, Conn.

WINDSOR Temporary Secretary-Treasurer, E. F. Cygan, c/o Manufacturers' Plating Company, Ltd., 1305 Windsor Avenue, Windsor, Ontario, Canada.

WINSTON-SALEM. Temporary Secretary, Michael Milo, c/o Bassick-Sack Company, Winston-Salem, N. C.